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NAVAL POSTGRADUATE SCHOOL

Monterey, California



THESIS

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AN ABSTRACT INTERACTIVE GRAPHICS INTERFACE
FOR THE IBM/PC AND MACINTOSH

by

Liang, Ko-Hsin

iii

June 1988

Thesis Advisor:

Daniel Davis

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An Abstract Interactive Graphics Interface for the IBM/PC and Macintosh

by

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B.S., Chinese Naval Academy, 1984

MASTER OF SCIENCE IN COMPUTER SCIENCE

from the

NAVAL POSTGRADUATE SCHOOL

June 1988

ABSTRACT

Different computer systems have different programming environments in spite of their similar capabilities. GEM and Macintosh software system both provide an operating environment in which the users can utilize all kinds of functions and routines to produce a user-friendly application program. Unfortunately, the programmers have to repeat the learning procedure and recode the source works if for some reason the application program is needed to run on both IBM PC and Macintosh microcomputers. In this thesis, a common interface is provided for programmers to reduce duplicated efforts and hopefully to get the same effect in both operating environments.

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TABLE OF CONTENTS

I.	INTRODUCTION.....	1
A.	PURPOSE OF THESIS	1
B.	TOOLS.....	2
II.	PROGRAMMING ENVIROMENT.....	3
III.	OVERVIEW OF GEM.....	7
A.	The Role of the AES.....	7
B.	The Role of the VDI.....	8
IV.	OVERVIEW OF MACINTOSH.....	9
V.	DESIGN OF THE COMMON INTERFACE	12
A.	Design Methodology and Abstract Data Type	12
B.	Design of the Primitive Object Library	15
1.	The Point Set	16
2.	The Rectangle Set	17
3.	The Point and Rectangle Translation Set.....	18
C.	Design of the Event Library	19
D.	Design of the Window Library.....	21
1.	The Structure of Window	21
2.	The Window Function Set.....	23
a.	Window Manipulation	23
b.	Scroll Bar Manipulation	25
c.	Drawing Background Manipulation.....	27
d.	Drawing Object Manipulation.....	28
e.	Text Manipulation	30
f.	System Manipulation.....	31
E.	Design of the Menu Library	32
VI.	IMPLEMENTATION	35
VII.	CONCLUSION AND RECOMMENATION	38
	APPENDIX A: Demo program listing	39

DEMO.C.....	39
ASFBIND.H.....	63
APPENDIX B: Mac implementation of Common Interface	69
ASBIND.H.....	69
DEMO.H.....	72
ASPRIM.C.....	73
ASEVT.C.....	77
ASEVTI.C.....	79
ASWIN.C	85
ASWINI.C	105
WINDECL.H	107
ASMENU.C.....	108
ASBIND1.H	110
APPENDIX C: GEM implementation of Common Interface.....	113
ASBIND.H.....	113
DEMO.H.....	116
ASPRIM.C.....	118
ASPRIMI.C.....	123
ASEVT.C.....	125
ASEVTI.C.....	132
ASWIN.C	134
ASWINI.C	159
ASMENU.C.....	168
ASBIND1.H	170
LIST OF REFERENCES.....	173
INITIAL DISTRIBUTION LIST.....	174

LIST OF FIGURES

Figure 1 Different Structure of Software System	2
Figure 2 The Role of the GEM Operating Environment	4
Figure 3 The Role of the Common Interface.....	6
Figure 4 Overview of Macintosh	10
Figure 5 The Relationship of All the Interface	12
Figure 6 The Data Structure and Functions in Abstract Data Type.....	14
Figure 7 A Rectangle and the Origin	16
Figure 8 An Active Window	22
Figure 9 Parts of a Scroll Bar.....	26
Figure 10 Menu	32
Figure 11 The Basic Structure of an Application Program.....	37

I. INTRODUCTION

Different computer systems have different programming environments in spite of their similar capabilities. Some system functions, utilized through programming language compilers, work in the environments supported by software production, or by system hardware. Although the environments of software development support similar algorithms and tools, they usually make software programmers write another program to obtain the same result from different computer systems. There is no standard interface for the various workstation (SUN, APOLLO, etc.) systems.

A. PURPOSE OF THESIS

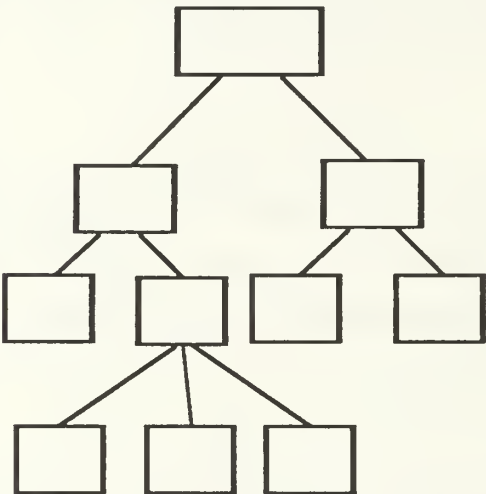
In this thesis, a common interface for a graphic software environment is established to create systematical functions which can be used for two different personal computing systems: Apple's Macintosh* and IBM PC series. The most important method used here to obtain this common interface is the Abstract Specification of data types, also named Abstract Data Type, consisting of a set of instances and a set of primitive operations which provide the only means for creating and interacting with the instances. The advantages of the Abstract Data Type, such as precise specification, modularity, and information hiding, can be very helpful for implementing the interfaces easily and with less errors. [Ref. 4, p. 18-19]

The development environment selected here is a graphics based software system that supports both window management and a menu driven style. The system is more user friendly and it becomes a definite trend toward the development of computer workstation systems because using the visual effects of graphics can generally communicate information more effectively than text. Menu displays save people the trouble of remembering many complex operation commands. The structure for user friendly system is different from the traditional structure of software (see Figure 1). The traditional software system is a kind of hierarchical structure that needs top-down approach to implement a program. The user friendly system needs a circular polling devices like mouse, keyboard, floppy disk drive, etc.

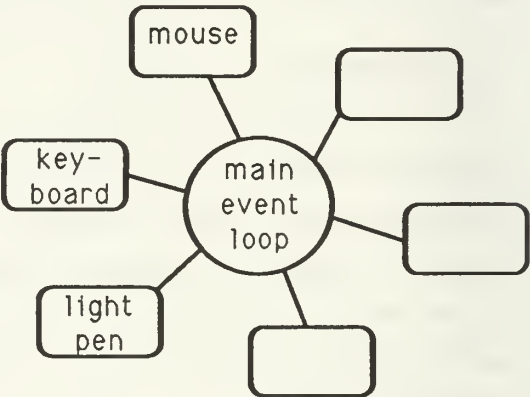
* Macintosh is a trademark of Apple Computer, Inc.

B. TOOLS

The primary development compiler and system language in this thesis is the C language. The C language is used primarily because it is easily ported to new systems and it allows the user to access his resources directly. For the Macintosh computer, LightspeedC™ (by THINK Technologies, Inc.) is used, and LATTICE C™ is used for the IBM PC computer with GEM (Graphics Environment Manager) which will be described later.



Traditional structure of software



Structure for user friendly system

Figure 1 Different Structure of Software Systems

II. PROGRAMMING ENVIRONMENT (User Interface Technology)

The operation and control procedures should be simple for the user to use the computer comfortably. A user-friendly system should provide all the information needed by the user in a graphics display. These graphic displays are referred to here as **desktop**. On the desktop, the user can slide documents around, organize work in folders, throw things away, or obtain new work—simply by moving the mouse and pressing the mouse button. The Macintosh Operating System supports such an operating and programming environment on Macintosh Computer [Ref. 2], and GEM provides a comparable environment for the IBM PC. GEM, developed by Digital Research, Inc.(DRI), is an operating environment which is similar to an operating system [Ref. 1]. Whereas an operating system allows the program to utilize console and disk devices in a standard manner, the GEM operating environment allows the GEM programmer to control a number of graphics devices and develop application interfaces in a consistent and standard fashion [Ref. 1]. So, these two environments allow a variety of high-level functions access to peripheral graphic devices and whose purpose is to make it easier for the application programmer to develop software that is both efficient and easy to use. In fact, the developed software is very similar to the window-type structure used in Macintosh software system, which is rather user-friendly in today's software development. Figure 2 shows the relationship between the application program, the user, and the computer [Ref. 1, p 4].

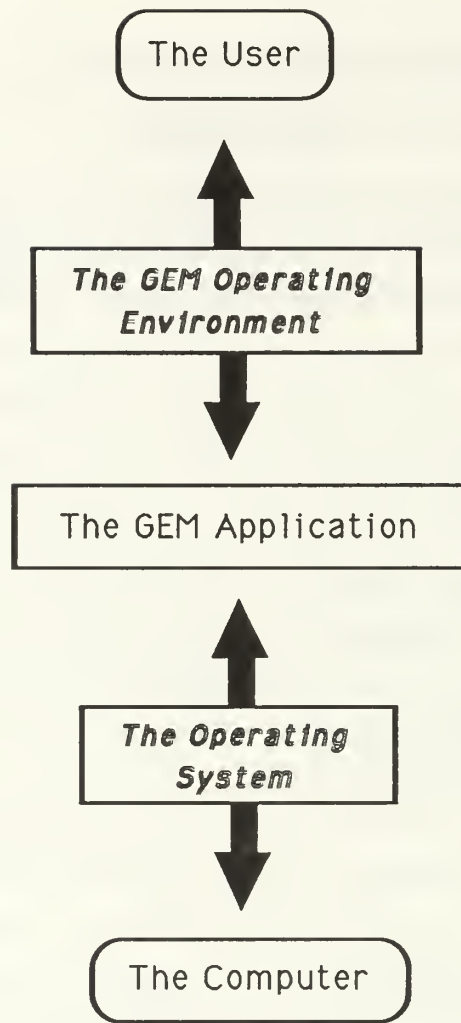


Figure 2 The Role of the GEM Operating Environment

With the GEM functions, the application program can control many devices manipulated by the user including the keyboard, the mouse, the screen, the printer, and the plotter [Ref. 1]. GEM is very similar to an operating system in that it allows the user to write programs without having to worry about what kind of mouse is attached to the computer, what resolution the screen has, or whether the computer's monitor is color or monochrome [Ref. 1].

Another example of a programming environment is the Operating System and the User Interface Toolbox in Macintosh [Ref. 2]. The application program will always call the routines which mostly are part of either the Operating System or the User Interface Toolbox and in the Macintosh ROM. The Operating System is at the lowest level; it does basic tasks such as input and output, memory management, and interrupt handling. The User Interface Toolbox is a level above the Operating System; it helps you implement the standard

Macintosh user interface in the application program [Ref. 3]. The user interface is the most important part of the user friendly computer system. In plain English, an interface is a junction or boundary where two things meet. In computerese, it refers to the set of rules and conventions by which one part of an organized system communicates with another. Whenever two components of the system come together, they exchange information by way of an interface [Ref. 3].

GEM and Macintosh software system both provide an operating environment in which the users can utilize all kinds of functions and routines to produce a user-friendly application program. Unfortunately, the programmers have to repeat the learning procedure and recode the source works if for some reason the application program is needed to run on both IBM PC and Macintosh microcomputers. In this thesis, a common interface is provided for programmers to reduce duplicated efforts and hopefully to get the same effect in both operating environments. The relationship between this common interface, the user, and the computers is shown in Figure 3.

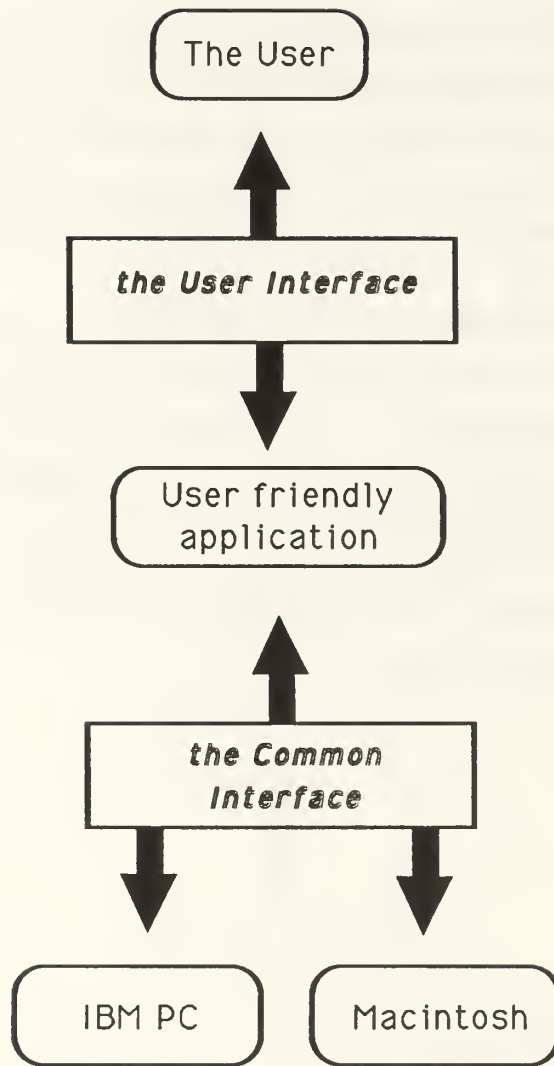


Figure 3 The Role of Common Interface

III. OVERVIEW OF GEM

The common interface mentioned last section actually consists of one interface with two drivers, one on IBM PC and the other on the Macintosh. It can be extended to any other mini- or microcomputers which provide a similar operating environment and a window and menu style structure. Before introducing the details of the common interface, the components of the GEM software environment will be described.

GEM consists of two major functional units: the Application Environment Services (AES) and the Virtual Device Interface (VDI); both provide a set of function libraries as a graphic interface [Ref. 1]. To build a typical GEM application, the user could implement the data fork and resource fork separately: the former basically consists of a set of procedures in the language that the program is written; the latter represents the menu bar and its associated submenus, form alerts, and dialogs created by another GEM application, known as the Resource Construction Set (RCS), which is provided by DRI. The RCS allows the programmer to construct the images, dialogs, and alerts that your application uses before any application code is written [Ref. 1]. GEM also provides some routines which build and deal with resources of application. It is less complicated when some important messages need to be modified without changing the application codes. This is a very important concept of establishing resources of a program because it saves the programmer a considerable amount of time and energy, when making complicated programming changes of some graphic structure. Thus, the application program is more flexible to change.

A. The Role of AES

The GEM AES provides routines which can be utilized to build the desktop and are organized in sets of related functions called *libraries* [Ref. 1]. For example, all the routines that manipulate windows are collected and form the Window Library of the AES, and all of the event routines form the Event Library, and so on [Ref. 1]. So, the AES represents a set of tools which can be useful when writing the first GEM application, the desktop, and in developing the common interface. AES includes a limited multitasking kernel, a screen Manager, and 11 libraries: Application, Event, Menu, Object, Form, Graphics, File Selector, Scrap, Window, Resource, and Shell. The GEM kernel is a limited multitasking system in that it can only handle five tasks: three desk accessory programs, one application, and the Screen Manager [Ref. 1]. Actually the Screen Manager is an internal task for event messages reporting to the AES event function. The GEM AES Event Library provides the

foundation that governs all user input in a GEM application. These input actions could be keyboard interrupts, mouse movement, mouse button changes, timer expiration, and messages in which some of them need the application to respond when receiving related events [Ref. 1].*

B. The Role of VDI

The purpose of the GEM VDI is to allow the user to control many different graphic devices with the same functions. The user can use the drawing routines to draw circles without considering what kind of output device will be used. This is very important because unlike IBM PC, Macintosh has more strict input and output constraints on hardware. IBM PC has a huge market share in the world and thousands of manufacturers who provide various competitive peripheral devices. Therefore, portability becomes indispensable for GEM. The VDI not only has a collection of drawing functions which can implement various shapes including points, markers, lines, polylines, graphics text, rectangle, and so on, but also control functions which open and close workstations (and virtual workstations) [Ref. 1].

* The details of all functions of other libraries can be found in the Programmer's Guide To GEM by Balma and Fidler (1986).

IV. OVERVIEW OF MACINTOSH

The Macintosh personal computer is designed in the way that the user can learn and use easily. Its revolutionary user interface distinguishes the Macintosh from other personal computers. Since the user interface acts as a good friend, it helps the user to communicate with the Macintosh comfortably. Everything on a Macintosh screen is displayed graphically; the Macintosh has no text mode. Generally speaking, the function sets are more detailed and includes more categories than GEM. All these functions are built into every Macintosh in ROM (read-only memory). The ROM can be divided into three parts: the Macintosh Operating System, which handles low-level tasks such as memory management, disk input/output, and serial communications; the QuickDraw graphics routines, which are responsible for everything displayed on the screen; and the User Interface Toolbox, which implements the higher-level constructs of the user interface, such as windows and menus [Ref. 3, p. 2]. The routines are divided according to function in Macintosh and are called "managers" [Ref. 2, p. I-9]. Figure 4 shows the whole function distribution in the Macintosh [Ref. 2, p. I-10].

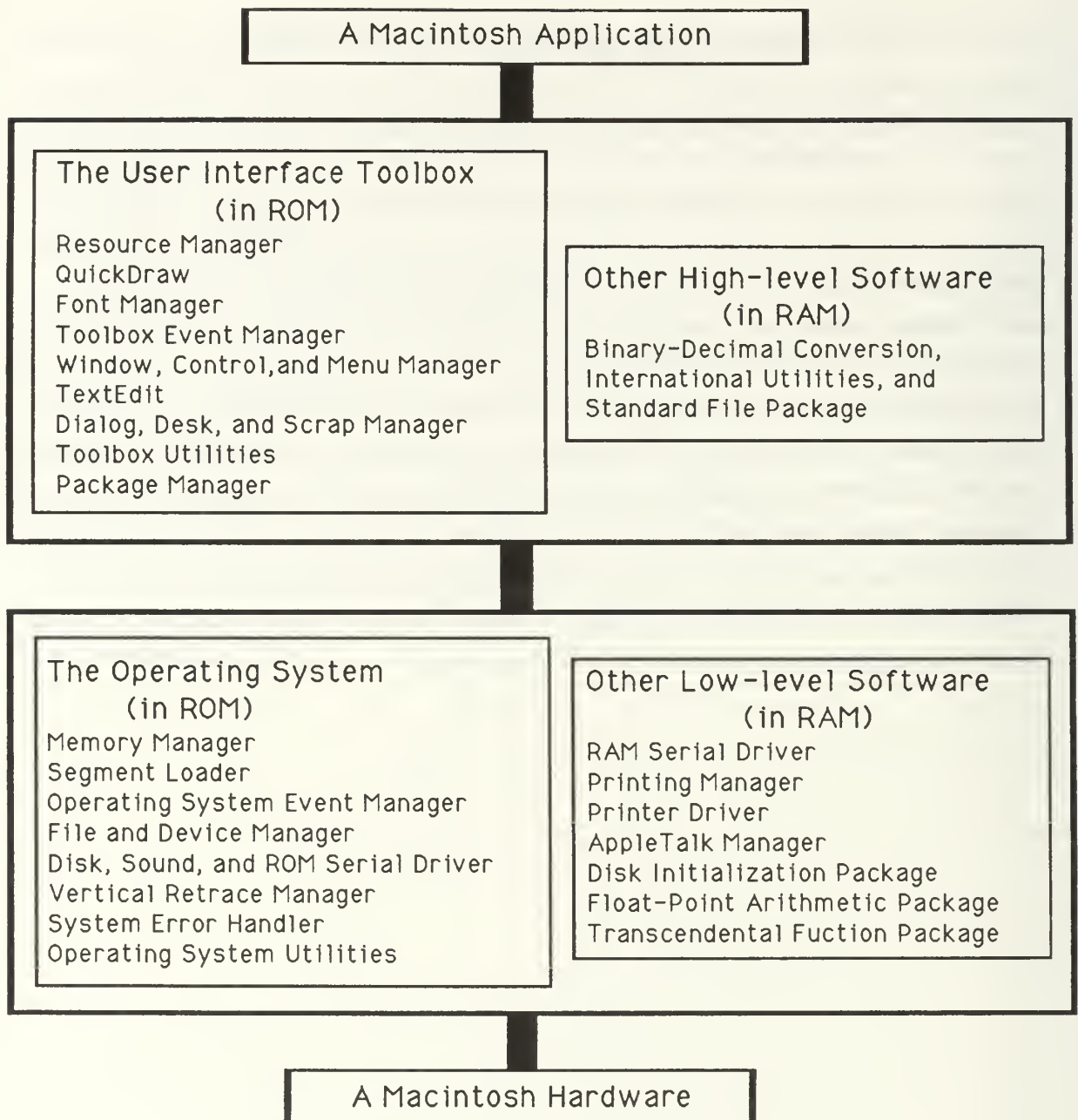


Figure 4 Overview of Macintosh

The Macintosh Toolbox also includes the Resource Manager which serves keep the data of an application separate from its code, making the data easier to modify and easier to share among applications. The Macintosh Resource Manager also supports more resource

types and more specified details than GEM. To manage and process the resource information, many utilities are available from the public domain [Ref. 2].

Before the Macintosh II come out, some routines in QuickDraw also enabled applications to do color drawing, including eight different colors, on color output devices. All nonwhite colors will appear as black on black-and-white output devices. In Macintosh II, more sophisticated color drawing routines are supported with 2^{32} colors.

Anyone who's used a Macintosh knows all about windows. The application displays all the information in the windows to the user, and the user tells the program what to do by clicking the mouse or hitting the keyboard. There can be any number of windows on the screen, and they can overlap in any order. Two different windows, the application window and the system window, both have their own characteristics to perform different tasks [Ref. 3].

Most of the time, the menu bar appears at the top of the screen, listing the titles of the available menus. One of the user's response to the program is to issue a command from an menu item under the title. Also, menus can be of various types in Macintosh to behave in certain standard ways. General speaking, the Macintosh Operating System and User Interface Toolbox provide a more complete function set of facilities for working with the User Interface than GEM does with its Operating Environment [Ref. 3]. For the same reason, it is also more complicated.

V. DESIGN OF THE COMMON INTERFACE

Before starting to implementing the common interface, we have to design what functions are required to provide the user access to the common interface, and we have to design common interface functions that both Macintosh and GEM can support. Basically the common interface is general purpose and should be extendable. Some special functions can be done by several algorithms and we need to think about possible procedures that can finish specified task, like window update and redraw, and also be compatible to different computers. Both GEM and Macintosh have detailed functions that may work in different ways, but their basic view of the user interface is similar. When we select the common portions of the functions, we may reduce function performance, but we also simplify the interface. Figure 5 shows the relationship of the Macintosh user interface, the common interface, and the GEM operating environment.

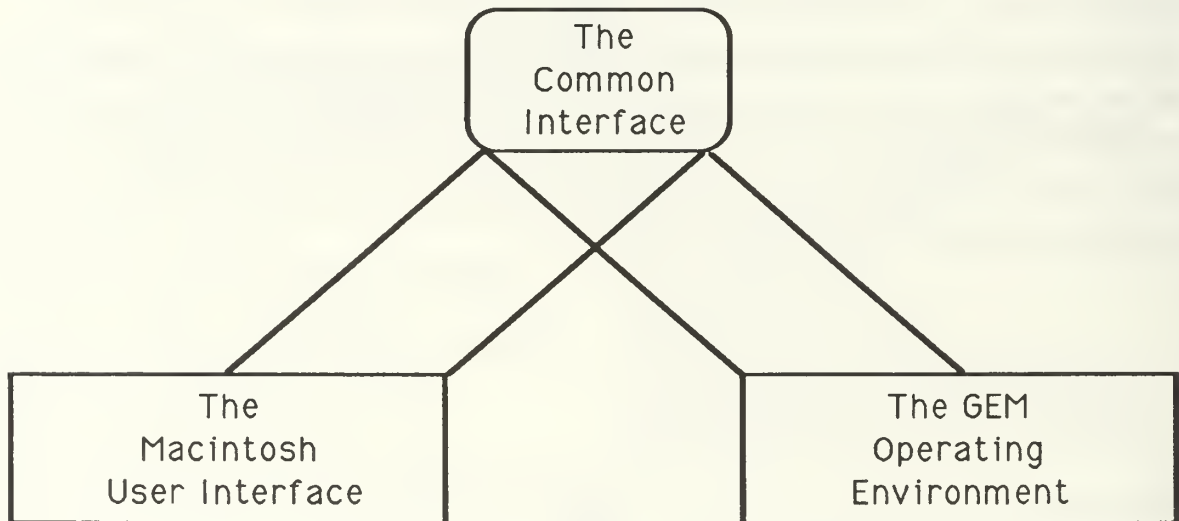


Figure 5 the relationship of all the interfaces.

To create the basic user-friendly interface, i.e., providing the complete graphical functions, at least four libraries must be built: the menu library, the primitive object library, the window library, and the event library.

A. Design Methodology and Abstract Data Type

When we decide to build a common interface which can perform graphic functions and window style, the most important consideration is the structure of this common interface and how to make the common interface easier to use. The structure of the

common interface can be divided into four libraries which can be implemented independently. Every library groups those functions which are relative to themselves. Also in every library, the functions can be further divided into several subgroups according to their tasks.

Before introducing the details of the libraries, we will discuss the design methodology and abstract data types of the common interface. In all of the primitive drawing objects, the rectangle acts a very important role in the common interface. When a circle, an ellipse, an arc, or a round rectangle are drawn, a rectangle is always needed for setting the drawing boundary and calculating the outline of the specified object. In GEM and Macintosh, they use different data structures to create a rectangle. GEM uses a top left point, a width and a height to specify a rectangle and Macintosh uses two points: a top left point and a bottom right point. It sounds tricky for us to decide which data structure is better. However, we are not going to worry about the data types of rectangle or point when using the concept of Abstract Data Type. We think about a rectangle in an abstract way. A rectangle consists of four points connected with four outer lines, and a point consists of two coordinate values, a horizontal and a vertical value, but not all the data are necessary to create a rectangle on the screen. In using the concept of Abstract Data Type, we simply design a set of functions that perform all the operations on a rectangle and achieve information hiding of the data structure. The programmer can do whatever he wants with a rectangle by utilizing these functions. Several representations, including the GEM and Macintosh ones, can be used to represent the rectangle and still support the rectangle functions defined in the abstract data type. The functions act like guards or interfaces that surround and protect the data structure in the center (see Figure 6). Obviously, the different data structures on the Macintosh and GEM are irrelevant. We follow the same design methodology of abstraction and information hiding on all the functions in the interface.

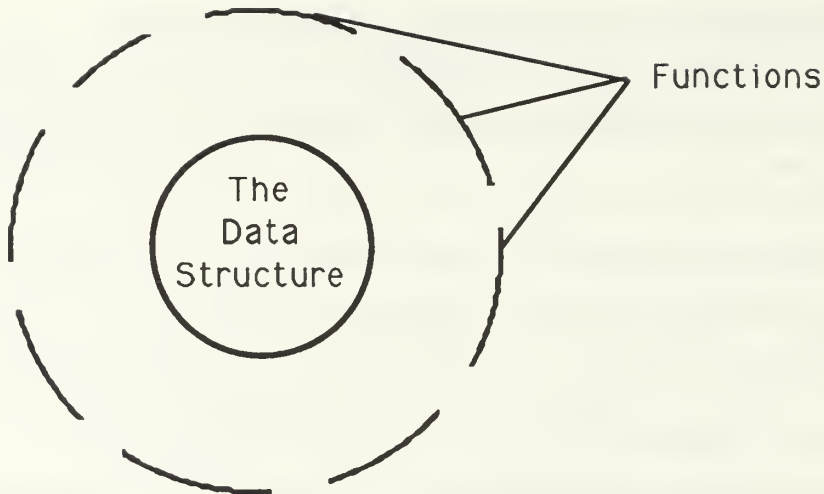


Figure 6 The Data Structure and Functions in Abstract Data Type

After implementing the design, the programmer won't need to manipulate the point and rectangle directly because he can utilize the functions which are provided by the common interface to deal with the rectangle or point. However, we still need to select a data type. In C, they are defined below:

```
typedef struct
```

```
{
    Int    v,h;
} Point ;
```

```
typedef struct
```

```
{
    Point    topLeft;
    Point    botRight;
} Rect ;
```

```
#define top      topLeft.v
#define left     topLeft.h
#define bottom   botRight.v
#define right    botRight.h
```

When the programmer wants to write an application program, the organization of the program becomes easy by using the concept of the common interface. In fact, the Event Library which provides the function that always generates fixed messages, or events, has

made the program only need to take care of the events. By notification of these events, the program can receive commands from the menu selection or handle the variation of the mouse button and movement issued by the user.

All the necessary definitions used by the common interface are put in the file "ASBIND1.H" for both Macintosh and GEM. To make sure that the program runs well, the programmer better selects the relative one when compiling the program. Similarly, the programmer might have a data type that is similar to the common interface to keep track of all the background information. The most obvious example in the DEMO program which will be introduced in next chapter, is the usage of the 'Winlist' structure which retains all the useful information about a window.

B. Design of the Primitive Object Library

The Primitive Object Library supports the manipulation of the primitive objects of the abstract specification — the Point and the Rectangle. As background, the graphic display device is subdivided into discrete areas known as pixels. As far as the graphic device is concerned, pixels are the smallest unit of manipulation. Reference to particular pixels on the abstract screen are via an imposed coordinate system. The origin or (0, 0) pixel is located at the upper left corner of the screen. In the Abstract Specification, there is a one to one mapping between points and pixels. A point is defined by specifying its horizontal and vertical displacement from the origin of a graphic environment. However, these displacements are relative to a particular window environment in which the point is used. Rectangles are defined by specifying the top left and bottom right corners of the rectangle (see Figure 7) [Ref. 2, p. I-140].

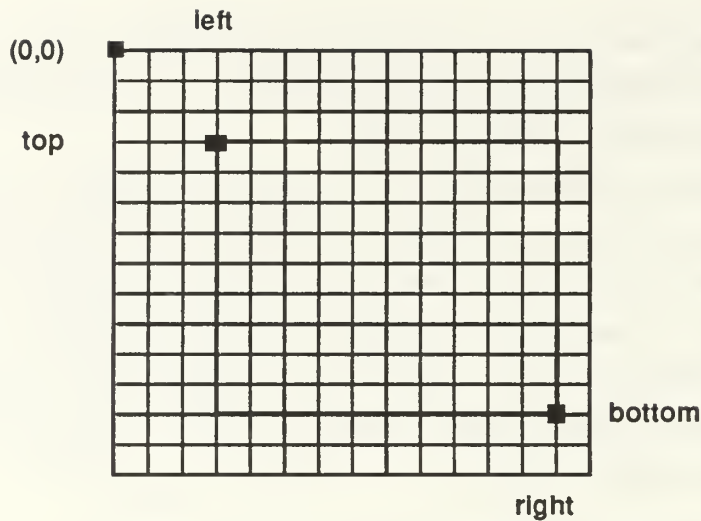


Figure 7 A Rectangle and the Origin

In the following description of the Primitive Object Library, as well as the other libraries, we will explain all functions in the C language style with their parameters. In the Primitive Object Library, the whole functions can be classified into three sets: the Point set, the Rectangle set, and the Point and Rectangle translation set.

1. The Point Set

As mentioned before, a point is specified by two integers which are coordinate values. We need enough functions to calculate or transfer the data type about point and integer. Some C compilers, because they do not allow passing **structs** as arguments, require the address of the Point to be passed instead. There are five functions in the Point set.

a. Set point by integers

Given two integers which represent the X and Y coordinate (the horizontal and vertical positions of the point respectively), the function returns a point.

State `set_point (x, y, pt)`

Input: Int x, y the value of the X and Y coordinate respectively.

Output: Point *pt the returned point.

b. Get X coordinate value from point

Function which returns the horizontal coordinate value of the input point.

Int `ret_val = get_x_coord (pt)`

Input: Point *pt the given point.

Output: Int ret_val the X coordinate value.

c. Get Y coordinate value from point

Function which returns the vertical coordinate value of the input point.

Int ret_val = get_y_coord (pt)

Input: Point *pt the given point.

Output: Int ret_val the Y coordinate value.

d. Test two equal points

Function which determines if the two input points are the same point.

Bool ret_val = equalpt (p1, p2)

Input: Point *p1, *p2 the two given points.

Output: Bool ret_val TRUE, if p1 and p2 are the same point.
FALSE, if not.

e. Copy point

Function which copies the source point into the destination point.

State copypt (source, dest)

Input: Point *source the given source point.

Output: Point *dest the returned destination point.

2. The Rectangle Set

Some functions, which pertain to the calculation of two rectangles, belong to this category.

a. Set intersection of rectangles

Function which determines the rectangle which is formed by the intersection of the two input rectangles. If the intersection is empty, the rectangle returned will be defined by a top left and bottom right point of (0, 0).

State set_insect_rect (r1, r2, rint)

Input: Rect *r1, *r2 the given two rectangle.

Output: Rect *rint the returned rectangle of intersection.

b. Test intersection of rectangles

Function which determines whether the two input rectangles intersect.

Bool ret_val = insect_rect (r1, r2)

Input: Rect *r1, *r2 the given two rectangle.

Output: Bool ret_val TRUE, if r1 and r2 intersect. FALSE, if not.

c. Test equal rectangles

Function which determines if the two input rectangles are the same rectangle.

Bool ret_val = equalrect (r1, r2)

Input: Rect *r1, *r2 the given two rectangle.

Output: Bool ret_val TRUE, if r1 and r2 are the same. FALSE, if not.

d. Copy rectangles

Function which copies the source rectangle into the destination rectangle.

State copypt (source, dest)

Input: Rect *source the given source rectangle.

Output: Rect *dest the returned destination rectangle.

3. The Point and Rectangle Translation Set

A rectangle is specified by two points. We need the Point and the Rectangle have enough operations to cover the information exchange. For example, type transfer from points to the rectangle or from the rectangle to the points.

a. Set rectangle by points

Function which, given two points, determines the smallest rectangle that those points could define and sets the top left and bottom right points of the output rectangle to correspond to that rectangle.

State set_rect (p1, p2, r)

Input: Point *p1, *p2 the given two points.

Output: Rect *r the returned rectangle.

b. Get the top left point from rectangle

Function which returns the top left point of the input rectangle.

State set_topLeft (r, p)

Input: Rect *r the given rectangle.

Output: Point *p the returned top left point.

c. Get the bottom right point from rectangle

Function which returns the bottom right point of the input rectangle.

State set_botRight (r, p)

Input: Rect *r the given rectangle.

Output: Point *p the returned bottom right point.

d. Test point in rectangle

Function which determines if the input point is within or on the border of the input rectangle.

Bool	ret_val = pt_in_rect (p, r)		
Input:	Point	*p	the given point.
	Rect	*r	the given rectangle.
Output:	Bool	ret_val	TRUE, if point p in rectangle r. FALSE, if not.

C. Design of the Event Library

Whenever the user presses the mouse button, or types on the keyboard, the application program is notified by means of an event. In the Abstract Specification, all events represent the user's actions. Not only the user can generate an event, also the event can generate another event. For instance, when the user drags a window away, the uncovered original region may need to be updated, and a redraw event is issued by the program. In Macintosh, more complicated events are also provided like disk-inserted event, network event, and device driver event, but there are only fundamental events in GEM. There are eight events that are summarized for the event function to meet the basic interface requirement. Two other mouse functions which relate to events are also included in the Event Library.

1. Get event function

Function which senses user interaction with the program, determines the type of interaction, and reports the user interaction to the program via the message globe data item. At present there are eight different types of events which are reported to the program:

a. Activate event

A notification that the user pressed the mouse button while the cursor was over an inactive window (requesting) to make that window active, and the application has to reorder the windows.

b. Redraw event

A notification that the work area of one of the windows present on the screen has been disturbed or exposed and must be rewritten.

c. Close window event

A notification that the user has pressed the mouse in the close box of the active window (if present).

d. Mouse down event

A notification that the user has pressed the mouse button in the working area of the active window.

e. Keyboard event

A notification that the user has typed the keyboard.

f. Mouse up event

A notification that the user has released the mouse.

g. Menu selection event

A notification that the user has selected a menu item.

h. Scroll bar event

A notification that the user has pressed the mouse in some part of the scroll bar.

Two functions are taken care of automatically by this routine : changing the size of a window in response to the user dragging in the window's grow box and moving a window in response to a user dragging in the title bar of the window.

State `get_event ()`

Input: none.

Output: 11 messages, in the following, are declared in "ASBIND1.H" file.

• **EVTTYPE**: always has a value to represent an event. There are 8 kinds of events that their program codes are shown below. The coming event always appends some relative and useful information, also shown behind the event, which can tell the programmer more details about the event.

- **REDRAW** with **EVTWINDOW**, **EVTRECT**.
- **TOPPED** with **EVTWINDOW**, **ENTPOINT**, **EVTMOD**.
- **CLOSEWIN** with none.
- **SCROLLBAR** with **EVTSCRPART**, **EVTSCRMOVE**, **EVTSCRPOSN**.
- **MOUSEDOWN** with **EVTWINDOW**, **EVTPOINT**, **EVTMOD**.
- **KEYBOARD** with **EVTKEY**, **EVTMOD**.
- **MOUSEUP** with **EVTWINDOW**, **EVTPOINT**, **EVTMOD**.
- **MENUHIT** with **EVTMTITLE**, **EVTMITEM**.

• **EVTWINDOW**: the returned window ID.

• **EVTRECT**: the rectangular area that needs redrawn.

• **EVTPOINT**: the cursor position when the event happened.

• **EVTSCRPART**: the scroll bar position report which the possible value is

V_PAGEUP, **V_PAGEDOWN**, **V_ROWUP**, **V_ROWDOWN**,
H_PAGEUP, **H_PAGEDOWN**, **H_ROWUP**, **H_ROWDOWN**,
V_THUMB, **H_THUMB**.

• **EVTSCRPOSN**: the scroll bar current setting. The minimum value of any scroll bar is zero, and the maximum one is 1000.

- EVTSCRMOVE: the difference that current setting minus the old one.
- EVTKEY: the input ASCII code.
- EVTMOD: the states of the modifier keys.
- EVTMTITLE: the selected menu title.
- EVTMITEM: the selected menu item.

2. Get mouse location

This function gets the current mouse position and outputs it in the local coordinate system of the specified window.

State `get_mouse(Id, pt)`

Input: Int Id the given window ID.

Output Point *pt the returned point of the mouse position.

3. Test mouse button

This is the function we use to get the state of the mouse up or down. It's useful when the user presses and moves the mouse as an action.

Bool ret_val = `mouse_up()`

Input: none.

Output: Bool ret_val FALSE, if mouse button is pressed.
 TRUE, if not.

E. Design of the Window Library

1. The Structure of Window

In the Abstract Specification, all objects (points, rectangles, etc) are defined in relation to the window which happens to be active at the time. The window, as an object consists of two basic regions, a structure region and a content region. The structure region contains the following objects (see Figure 7 about window structure):

a. Title bar

Bar at the top of the window containing the window's title.

b. Move area

Lined area of the title bar which can be clicked in to move the window.

Normally the move area is the same as the title bar area.

c. Close box

White rectangle which when clicked in, signals that the user desires to close the window.

d. Scroll bar:

Bars on the right and bottom of the window, used to signal the user's desire to move the window's contents up, down or side to side.

e. Grow box:

Area at bottom right of window, which when clicked and dragged around, changes the size of the window.

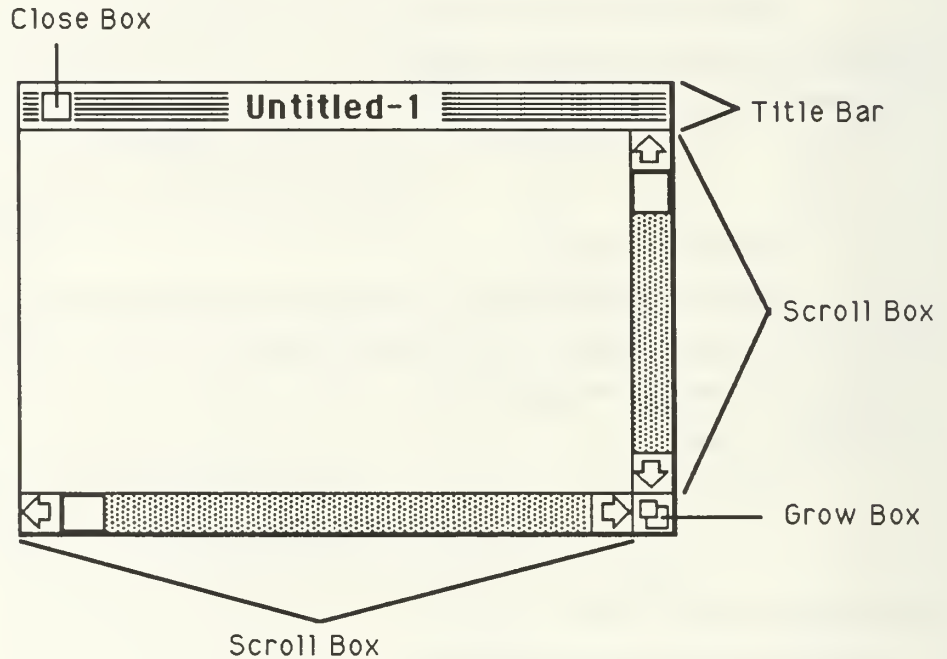


Figure 8 An active window

The remaining portion in the center of the window is the content region. This region can be thought of as an independent screen with its own local coordinate system whose origin (0,0) is at the top left corner of the content region. The basic system window, the desktop, is slightly different, having only a menu bar area at the top and then its content region. At any one time, there is a window which is "on top" of the screen. This window is the active window. All drawing activities take place in the active window except in the case of an update, in which case it takes place in the window specified.

All windows once allocated are managed by the window ID number which is assigned at the time of creation. To prevent out of memory errors, the maximum number of available windows is eight. In general, the programmer has to keep the ID information while manipulating multiple windows.

2. The Window Function Set

All functions used to manipulate windows and other relative objects, can be divided into six parts.

a. Window Manipulation

There are several basic functions here to manipulate windows as a whole entity.

i. Create a new window

Function which allocates space for a new window and displays it as the active window. The programmer can create new windows with different optional properties such as vertical and horizontal scroll bars, close box, grow box, etc.

Window_id ret_val = set_new_window (InitRect, Partspec, Title, is_Visible)

Input: Rect *InitRect a rectangle, given in global coordinates, determines the window's size and location.

 Bit16 Partspec specifies which optional parts of the window are to be included (see below).

 Parts (optional): defined in "ASBIND1.H" file.

 W_NAME include a title bar;

 W_CLOSE include a close box;

 W_SIZE include a size box;

 W_HSCROLL include a horizontal scroll bar;

 W_VSCROLL include a vertical scroll bar.

(To include more than one option, pass a bitwise OR of any combination of above)

 Char Title address of string to be used as a title for the window.

 Bool is_Visible TRUE, if the window is to be displayed;
 FALSE, if not.

Output: Window_id ret_val the identifier of the new window.

ii. Show window

Function which draws an invisible but previously defined window onto the screen. This window becomes the active window.

State show_window (Id)

Input: Window_id Id the given window identifier.

Output none.

iii. Hide window

Function which removes the specified window from the screen without deallocating it.

State	hide_window (Id)		
Input:	Window_id	Id	the given window identifier.
Output	none.		

iv. Activate window

Function which causes the specified window to become the active window. It causes any window (but the desktop with a ID number of 0) to be moved to the top and a new background will be drawn in, however, the contents will not be automatically redrawn.

State	activate_win (Id)		
Input:	Window_id	Id	the given window identifier.
Output	none.		

v. Close window

Function which closes and permanently deallocates the specified window.

State	close_window (Id)		
Input:	Window_id	Id	the given window identifier.
Output	none.		

vi. Update window

Function which sets the system into the update window mode, drawing will be limited to the visible region of the window to be updated (as identified by the ID number input) to the function. When given a rectangular area to update, the function will return the intersection between that area and one of the rectangles which define the visible area of the window to be updated. In the Macintosh, the update event happens window by window (in front to back order). In GEM, when a REDRAW event is issued, a rectangle list, divided from the screen and window, is built for the program to update. Thus, the programmer always needs to pass the EVTRECT to this function.

Bool	rec_val = update_win (ID, Up_rct, Dr_rct)		
Input	Window_id	ID	the ID of the window that will be updated.
	Rect	*Up_rct	the rectangle to be updated.
Output:	Rect	*Dr_rect	the intersection of update rectangle and visible region.
	Bool	ret_val	TRUE, if need updat. FALSE, if not.

vii. Update next window

To solve the update problem of GEM and Macintosh, this function moderates the conceptual difference between two computers and completes the update mission without having much redundant work. In Macintosh, this function does nothing and always returns false. But, it is still useful for GEM.

Bool	rec_val	=	next_update (Up_rct, Dr_rct)
Input	Rect	*Up_rct	the rectangle to be updated.
Output:	Rect	*Dr_rect	the intersection of update rectangle and visible region.
Bool	ret_val		TRUE, if next update is necessary; FALSE, if not.

viii. End updating window

Function to ends the update mode and restore the clip area to match the active (topmost) window. The programmer always has to call update_win() when receiving a REDRAW event, and call end_update() at the end of update.

State	end_update ()
Input:	none.
Output:	none.

ix. Find active window

Function which shows the identifier of the active window.

Window_id	ret_val	=	get_active()
Input:			none.
Output	Window_id	ret_val	the returned window ID.

b. Scroll Bar Manipulation

In fact, scroll bar is part of control facilities of a window to adjust the viewing position of the document of the window. The scroll bar is divided into five parts to perform different functions. The up and down arrows scroll the window's content a line at a time. The paging up and down regions scroll a page at a time. The thumb can be dragged to any position in the scroll bar, to scroll to a corresponding position within the document (see Figure 9) [Ref. 2]. Six functions are shown below.

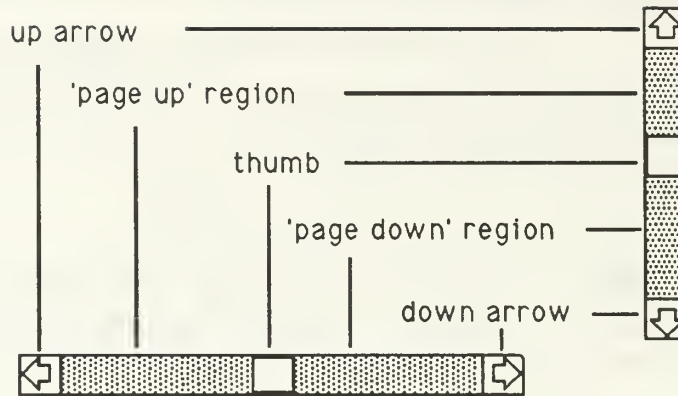


Figure 9 Parts of a scroll bar

i. Horizontal content scrolling

Function which scrolls the content area of the active window by the specified number of pixels. If the number is positive, the region will move to the left, and to the right if negative. The returned rectangle, which was previously covered, will show up now and should be passed for update.

State	hscroll (num, Up_rect)	
Input:	Int num	the pixel number to scroll
Output	Rect *Up_rect	return the rectangle which will be updated

ii. Vertical content scrolling

Function which scrolls the content area of the active window by the specified number of pixels. If the number is positive, the region will move up, and down if negative. The returned rectangle, which was previously covered, will show up now and should be passed for update.

State	vscroll (num, Up_rect)	
Input:	Int num	the pixel number to scroll
Output	Rect *Up_rect	return the rectangle which will be updated

iii. Set horizontal scroll bar value

Function which sets the value of the horizontal scroll bar of the active window.

State	set_hscroll (val)	
Input:	Int val	new horizontal scroll bar setting.
Output:	none.	

iv. Set vertical scroll bar value

Function which sets the value of the vertical scroll bar of the active window.

State `set_vscroll (val)`

Input: `Int val` new vertical scroll bar setting.

Output: `none.`

v. Get horizontal scroll bar value

Function which returns the horizontal scroll bar value.

`Int ret_val = get_hscroll ()`

Input: `none.`

Output: `Int ret_val` the returned horizontal scroll bar value.

vi. Get horizontal scroll bar value

Function which returns the horizontal scroll bar value.

`Int ret_val = get_vscroll ()`

Input: `none.`

Output: `Int ret_val` the returned vertical scroll bar value.

c. Drawing Background Manipulation

Abstraction Specification of graphic objects has three different kinds of characteristic: background pattern, mode, and color. Pattern includes black, dark gray, gray, light gray, and white. Mode includes replace, transparent, xor, and reverse transparent. Color includes light and dark which both include white, black, red, green, blue, cyan, yellow, and magenta.

i. Set pattern

Function which sets the pattern to be used to draw and fill in shape.

State `set_pattern (newpattern)`

Input: `Pattern_id newpattern` the given pattern ID.

Output: `none.`

ii. Set mode

Function which sets the global mode for drawing onto the screen.

State `set_xfer_mode (newmode)`

Input: `Pattern_id newmode` the given transfer mode ID.

Output: `none.`

iii. Set color

Function which sets the global color for drawing.

State set_color (newcolor)
Input: Color_id newcolor the given color ID.
Output: none.

iv. Get pattern

Function which returns the identifier of the drawing pattern.

Pattern_id ret_val = get_pattern ()
Input: none.
Output: Pattern_id ret_val the returned pattern ID.

v. Get mode

Function which returns the identifier of the drawing transfer mode.

Mode_id ret_val = get_xfer_mode ()
Input: none.
Output: Mode_id ret_val the returned transfer mode ID.

vi. Get color

Function which returns the identifier of the drawing color.

Color_id ret_val = get_color ()
Input: none.
Output: Color_id ret_val the returned color ID.

d. Drawing Object Manipulation

Drawing functions are the most important part of the Abstract Specification. The reason we put this function in the Window Library is all object drawing routines happen in a window. All of the drawing happens in the active window with the current setting of pen mode, pen pattern, and color. The coordinates of the input point or rectangle are assumed to be relative to the top left corner of the active window's work area. There are five kinds of object supported in the Abstract Specification : line, rectangle, ellipse, arc and round rectangle.

i. Draw a line

Function which draws a line in the currently active window.

State drawline (St_pt, End_pt)
Input: Point *St_pt the starting point.
 Point *End_pt the ending point.
Output: none.

ii. Draw a rectangle

Function which draws the outline of a rectangle in the active window.

State drawrect (In_rect)

Input: Rect *In_rect the given rectangle.

Output: none.

iii. Draw an ellipse

Function which draws the outline of an ellipse within the specified rectangular area of the active window.

State drawellipse (In_rect)

Input: Rect *In_rect the given rectangle.

Output: none.

iv. Draw an arc

Function which draws the outline of an elliptical arc between the two input angles within the specified rectangular area of the active window.

State drawarc (R, begang, endang)

Input: Rect *R the given rectangle.

 Int begang the starting angle.

 Int endang the ending angle.

Output: none.

v. Draw a round rectangle

Function which draws the outline of a round rectangle within the specified rectangular area of the active window.

State drawrndrect (In_rect)

Input: Rect *In_rect the given rectangle.

Output: none.

vi. Fill a rectangle

Function which fills the outline of a rectangle in the active window.

State fillrect (In_rect)

Input: Rect *In_rect the given rectangle.

Output: none.

vii. Fill an ellipse

Function which fills the outline of an ellipse within the specified rectangular area of the active window.

State fillellipse (In_rect)

Input: Rect *In_rect the given rectangle.

Output: none.

viii. Fill an arc

Function which fills the outline of an elliptical arc between the two input angles within the specified rectangular area of the active window.

State fillarc (R, begang, endang)

Input: Rect *R the given rectangle.

Int begang the starting angle.

Int endang the ending angle.

Output: none.

ix. Fill a round rectangle

Function which fills the outline of a round rectangle within the specified rectangular area of the active window.

State fillrndrct (In_rect)

Input: Rect *In_rect the given rectangle.

Output: none.

e. Text Manipulation

In the Abstract Specification, only a few functions are available for the basic manipulation of text.

i. Set text pen position

Function which sets the location of the next character to be drawn in the active window (location of text pen in window local coordinates).

State txtpen (inpt)

Input: Point *inpt the given text location.

Output: none.

ii. Get text pen position

Function which returns the location of the text pen for the currently active window (in window local coordinates).

State set_txtpen (pen)

Input: none.

Output: Point *pen the returned text location.

iii. Write string

Function which draws a string into the active window at the current location of its text pen.

State drawstring (strptr)
Input: Char *strptr the string which will be drawn.
Output: none.

iv. Write character

Function which draws a character at the current location of the active window's text pen.

State drawstring (inchr)
Input: Char inchr the character which will be drawn.
Output: none.

v. Get character width

Functions return the current character width.

Int ret_val = get_wchar ()
Input: none.
Output Int ret_val the character width.

vi. Get character height

Functions return the current character height.

Int ret_val = get_hchar ()
Input: none.
Output Int ret_val the character height.

f. System Manipulation

The programmer needs to call sys_init() and sys_end(), which will be described below, at the beginning and end of the program respectively.

i. System initialization

Function to initialize the system to run the Abstract Specification Interface.

State sys_init ()
Input: none.
Output: none.

ii. Exit application program

Function which returns all allocated resources to the system at the end of the program.

State sys_end ()
Input: none.
Output: none.

E. Design of the Menu Library

Menu selection is a method used to issue a command to the application program. This is one of the most important and user-friendly characteristics of the common interface, the user just moves and clicks the mouse around the screen to control the application program without typing the keyboard. GEM menus are known as drop-down menus because when the user moves the mouse over the menu bar, the GEM Screen Manager drops the entire menu down onto the screen. In contrast, the Macintosh uses pull-down menus, which work by having the user click on the desired menu title, and, holding the button down, move through the menu highlighting each pointed-at item. By releasing the button the user selects the last highlighted item. Thus, on the Macintosh, the menu is displayed as long as the button remains depressed, whereas GEM menus are visible until the user moves the mouse out of the menu, either into another menu or to another part of a screen. GEM menus are also different in that the mouse button is used to select a menu item. As shown in Figure 10, the application highlights the title and displays the menu items [Ref. 2, p. I-52].

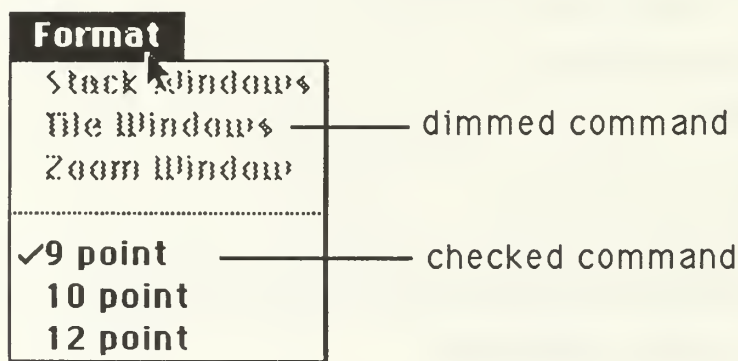


Figure 10 Menu

The GEM Menu Library only provides the fundamental functions required, but the Macintosh Menu Manager includes the complete works of the menu functions. To collect the necessary set, there are five basic menu routines that are chosen for performing menu functions.

1. Menu bar initialization

This function always has to be called by the programmer at the beginning of the application to show the menu bar. Here we need the resource file name prepared in advance. So before passing the resource file name to this function, the programmer must

utilizes the respective resource maker utility program supported from DRI and Apple Computer, Inc., to edit the menu resource for the application program* .

State `init_menu (filename, barid)`

Input: `char *filename` the resource file name
 `Menu_id barid` the menu ID specified by resource utility.

Output: none.

2. Menu item enable

To make sure the user can issue the proper commands, the application program may only allow certain commands to be selectable. This function corresponds to the menu item disable which will be mentioned next.

State `item_enble (menunum, itemnum)`

Input: `Int menunum` the menu title number
 `Int itemnum` the menu item number

Output: none.

3. Menu item disable

In some specified situation, some unacceptable or unnecessary commands must be disabled. A disabled item cannot be chosen; it appears dimmed in the menu and is not highlighted when the cursor moves over it. You can change the enabled or disabled state of a menu item with this and the last function.

State `item_disable (menunum, itemnum)`

Input: `Int menunum` the menu title number
 `Int itemnum` the menu item number

Output: none.

4. Set menu item check mark

The programmer can place a check mark to the left of the text of the menu item. This action can clearly tell the user which command is working or what state is presenting. With this function, the programmer can set or clear the check mark.

State `item_mark (menunum, itemnum, mark)`

Input: `Int menunum` the menu title number
 `Int itemnum` the menu item number

* There are several utilities available, include RMaker, ResTool, and ResEdit, for the Macintosh computer. Also, GEM has the Resource Construction Set supported by DRI for the same purpose.

Bool	mark	if TRUE, then a check mark will appear each subsequent time the menu is pulled down. If FALSE, then remove the check mark from the menu item.
------	------	---

Output: none.

5. Menu title highlighting

When an item is selected, the menu title in the menu bar remains highlighted until the command has completed execution. So after the menu is selected, the application should perform the chosen task and then call this function to unhighlight the chosen menu title. The programmer can also use this function to highlight the menu title. Since only one menu title can be highlighted at a time, it unhighlights any previously highlighted menu title.

State	menu_hilight (menunum, hilight)		
Input:	Int	menunum	the menu title number
	Bool	hilight	if TRUE, then hilight the title of given menu. If FALSE, unhilight the chosen menu title.
Output:	none.		

VI. IMPLEMENTATION

In this section we will discuss some details of implementing the common interface and the testing of a demonstration program. This mini interface actually provided only basic functions for building an application program. To fully utilize the available functions, we have to introduce all the other necessary features and properties of the programming environment. First, we will examine the designing of the data structures, then all the functional abilities of these libraries. In the view of a design task, the design of the data structures should be put last. But the whole design is actually digested in the GEM and Macintosh programming environments to get a feasible intersection. So, here we just use the data structure to establish the direction of the implementation work.

There are several special data structures and defined constant data which were designed for the Event and Window Library to be utilized by the programmer. The following descriptions show some detail notes about the Abstract Specification of implementation:

- **The window type and limitation**

- The maximum number that an application can open at a time is limited under seven to prevent out of memory. Because we have to control our own window by the data structure which summarized from the GEM and Macintosh, and specify the number of windows during the compile time.
- Every window has its own identifier instead of a window pointer to its location.
- The scroll bar is regarded as part of the window structure. The thumb value is between zero and 1000.
- The Desktop on the screen has the window identifier value zero. When an invalid window happens in any function its identifier value is -1.
- A newly created window has options to include title, close box, grow box, the horizontal and/or vertical scroll bar.

- **The event structure**

- the notification of of a event is always accompanied by different information which depends on the event. A keyboard event comes with the key stroke and the state of the modifier keys. Menu selection events come with the selected menu title and item. Redraw event comes with the window and rectangle which needs redrawn. Mouse down event comes with the mouse down window,

cursor point, and the state of modifier keys. Update, close window event comes with the window where the event happened. Scroll bar event comes with the specified part of scroll bar, and the new thumb position.

—all events are enqueued into an internal first in first out data structure.

—all windows can always be dragged or sized, but the actions might generate redraw events depending on whether the hidden parts of inactive window appear.

- **The graphic object structure**

—the graphic objects can be line, rectangle, ellipse, arc and round rectangle. Except line object, the other objects can be drawn either outline only or with pattern in.

—the background of all objects include color, pattern, and mode that they all can be represented by the specified identifier value.

- **The basic structure of a standard program**

—the DEMO program shown in appendix has a basic structure and it can be a good reference for the programmer. Normally, the programmer takes responsibility of the content of the include file and resource file for the application.

—the programmer should always include the "ASBIND.H" and "ASFBIND.H" files. The ASBIND.H comprises the binding data type of Abstract Specification, the ASFBIND.H includes all the binding functions call of Abstract Specification.

--the following flow chart shows the basic style of an application.

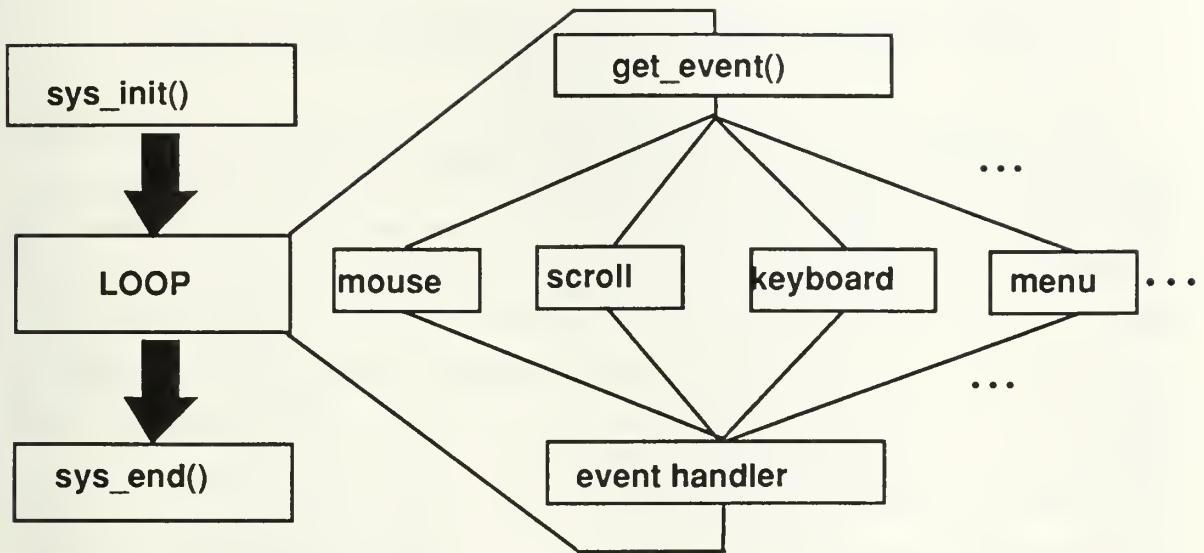


Figure 11 The Basic Structure of an Application Program

For the purpose of understanding how this Abstract Specification of the common interface will work, there is a demo program in appendix illustrating the basic graphic application and how those functions can be applied by the user.

VII. CONCLUSION AND RECOMMENDATION

In the beginning of this paper we mentioned that the purpose of this common interface is to make the same source code run on an IBM PC under the GEM environment and the Apple Macintosh with the same effect. This idea could be used to improve the portability of many applications since the application could be separated into system dependent and system independent (common interface) routines. We have achieved this purpose since the source code that uses the common interface of either system is independent. When the programmer want to run the same result on other different machines, he can just rewrite the system dependent part. In this thesis, we just prove that it is possible to support the common interface (system dependent part) to the programmer and save duplicated works. Clearly only one drawing demo program cannot prove that the common interface will work correctly when further used in other more sophisticated application program, but it does prove the feasibility of the idea. Of course, in the intersection of the GEM and Macintosh we lose some of their origional powerful abilities, but if the system dependent part of an application can expand and provide other functions, then the concept of the common interface could be an important idea.

For further study, we recommend that this idea be examined on other systems. For example, can the same abstract design be implemented on top of X-Windows on Unix, or MS Windows on MS-DOS? Such an effort would lead to a better understanding of this type of interface.

APPENDIX A

Demo program listing

```
/*-----*/
/*                      DEMO.C                      */
/*-----*/

#include      "asbind.h"
#include      "asfbind.h"
#include      "demo.h"

#define      SINGSCR      20
#define      PAGES      4
#define      COLPAGE      20

#define      NUMDR      100

char  *Title[MAXNUMWIN] = begin
                                "DrawWindow1 ",
                                "DrawWindow2",
                                "DrawWindow3",
                                "DrawWindow4",
                                "DrawWindow5",
                                "DrawWindow6",
                                "DrawWindow7",
                                end;

typedef      struct  drstr
begin
    Rect      drrect;
    Color_id  drcol;
    Mode_id   drmo;
    Pattern_id  drpat;
    int       drshp;
    Bool      drfill;
end drstr;

typedef      struct  winstr
begin
    Window_id  winid;
    drstr      Drawn[NUMDR];
    Int        drawent;
    Color_id   wincol;
    Mode_id    winmode;
    Pattern_id winpat;
    Bool       doline;
    Bool       dofill;
    Bool       dodark;
    Int        selPat;
    Int        selCol;
    Int        selMod;
    Int        Shape;
```

```

        Bool      Created;
        Bool      Visible;
end    winstr;

        Point     Tl,Br;
        Rect      winrect;

        winstr     Winlist[MAXNUMWIN];
        Int        Lastactive;

/*-----*/
/*-----*/

        Int
Findindex(Id)

        Window_id  Id;

begin
        Int        I;

        if (Id == DESK_WIN)
                return(INVALID);

        for(I = 0; ((I < MAXNUMWIN) && (Winlist[I].winid != Id)); I++);

        return(I);

end

/*-----*/
/*-----*/

        Void
ResetMenus(oldind,Index)

        Int        oldind;
        Int        Index;

begin

        if (oldind == INVALID)
                oldind = Lastactive;

                /* handle drawing menu */

        if (Winlist[Index].dofill != Winlist[oldind].dofill)
        begin
                if (Winlist[oldind].dofill)
                begin
                        item_mark(MNDRAW,ITOUTLN,TRUE);
                        item_mark(MNDRAW,ITFILL,FALSE);
                end
        end

```

```

else
begin
    item_mark(MNDRAW,ITOUTLN,FALSE);
    item_mark(MNDRAW,ITFILL,TRUE);
end

end

item_mark(MNDRAW,Winlist[oldind].Shape,FALSE);
item_mark(MNDRAW,Winlist[Index].Shape,TRUE);

if (Winlist[Index].doline != Winlist[oldind].doline)
begin
    if (Winlist[oldind].doline)
    begin
        item_enable(MNDRAW,ITOUTLN);
        item_enable(MNDRAW,ITFILL);
        item_enable(MNDRAW,ITRECT);
        item_enable(MNDRAW,ITELLIP);
        item_enable(MNDRAW,ITARC90);
        item_enable(MNDRAW,ITARC180);
        item_enable(MNDRAW,ITARC270);
        item_enable(MNDRAW,ITRNRDCT);
        item_mark(MNDRAW,ITSHAPE,TRUE);
        item_mark(MNDRAW,ITLINE,FALSE);
    end

    else
    begin
        item_disable(MNDRAW,ITOUTLN);
        item_disable(MNDRAW,ITFILL);
        item_disable(MNDRAW,ITRECT);
        item_disable(MNDRAW,ITELLIP);
        item_disable(MNDRAW,ITARC90);
        item_disable(MNDRAW,ITARC180);
        item_disable(MNDRAW,ITARC270);
        item_disable(MNDRAW,ITRNRDCT);
        item_mark(MNDRAW,ITSHAPE,FALSE);
        item_mark(MNDRAW,ITLINE,TRUE);
    end

end

end

/* handle mode menu */

item_mark(MNMODE,Winlist[oldind].selMod,FALSE);
item_mark(MNMODE,Winlist[Index].selMod,TRUE);

/* handle color menu */

if (Winlist[Index].dodark != Winlist[oldind].dodark)
begin
    if (Winlist[oldind].dodark)

```



```

        begin
            item_mark(MNCOLOR,ITLIGHT,TRUE);
            item_mark(MNCOLOR,ITDARK,FALSE);
        end

        else
        begin
            item_mark(MNCOLOR,ITDARK,TRUE);
            item_mark(MNCOLOR,ITLIGHT,FALSE);
        end

    end

    item_mark(MNCOLOR,Winlist[oldind].selCol,FALSE);
    item_mark(MNCOLOR,Winlist[Index].selCol,TRUE);

    item_mark(MNPATTRN,Winlist[oldind].selPat,FALSE);
    item_mark(MNPATTRN,Winlist[Index].selPat,TRUE);

end

/*-----*/
/*-----*/

DoScroll(part,newposn,amtmove)

    int    part,newposn,amtmove;

begin
    int            numscr,oldh,oldv,newh,newv,pixperscr;
    Rect          uprect;
    Window_id     Active;

    Active = get_active();
    numscr = 1;
    pixperscr = (SINGSCR * PAGES * COLPAGE) / MAXSCR;

    switch (part)
    begin

    case H_PAGEDOWN:
        numscr = COLPAGE;

    case H_ROWDOWN:
        begin
            numscr *= SINGSCR;
            newh = numscr / pixperscr;
            oldh = get_hscroll();
            newh += oldh;

            if (newh > MAXSCR)
                begin

```

```

        newh = MAXSCR;
        numscr = (newh - oldh) * pixperscr;
    end

    hscroll(numscr,&uprect);
    set_hscroll(newh);
    DoUpdate(Active,&uprect);
    break;
end;

case H_PAGEUP:
    numscr = COLPAGE;

case H_ROWUP:
begin
    numscr *= (- SINGSCR);
    newh = numscr / pixperscr;
    oldh = get_hscroll();
    newh += oldh;

    if (newh < 0)
    begin
        newh = 0;
        numscr = (newh - oldh) * pixperscr;
    end

    hscroll(numscr,&uprect);
    set_hscroll(newh);
    DoUpdate(Active,&uprect);
    break;
end;

case V_PAGEDOWN:
    numscr = COLPAGE;

case V_ROWDOWN:
begin
    numscr *= SINGSCR;
    newv = numscr / pixperscr;
    oldv = get_vscroll();
    newv += oldv;

    if (newv > MAXSCR)
    begin
        newv = MAXSCR;
        numscr = (newv - oldv) * pixperscr;
    end

    vscroll(numscr,&uprect);
    set_vscroll(newv);
    DoUpdate(Active,&uprect);
    break;
end;
end;

```

```

case V_PAGEUP:
    numscr = COLPAGE;

case V_ROWUP:
begin
    numscr *= (- SINGSCR);
    newv = numscr / pixperscr;
    oldv = get_vscroll();
    newv += oldv;

    if (newv < 0)
    begin
        newv = 0;
        numscr = (newv - oldv) * pixperscr;
    end

    vscroll(numscr,&uprect);
    set_vscroll(newv);
    DoUpdate(Active,&uprect);
    break;
end;

case H_THUMB:
begin
    numscr = pixperscr * amtmov;
    hscroll(numscr,&uprect);
    set_hscroll(newposn);
    DoUpdate(Active,&uprect);
    break;
end;

case V_THUMB:
begin
    numscr = pixperscr * amtmov;
    vscroll(numscr,&uprect);
    set_vscroll(newposn);
    DoUpdate(Active,&uprect);
    break;
end;

default:      break;

end

end

/*-----*/
/*-----*/

DoUpdate(Id,uprect)

    Window_id  Id;
    Rect       *uprect;

```

```

begin
    Bool      Flag;
    Rect      Dummy;
    int       I;
    int       tmpshape;
    Bool      tmpdofill;
    Int       Winindex;
    Window_id tmpActive;

    Winindex = Findindex(Id);

    Flag = update_win(Id,uprect,&Dummy);
    tmpshape = Winlist[Winindex].Shape;
    tmpdofill = Winlist[Winindex].dofill;

    while (Flag)
    begin
        for(I = 0;I < Winlist[Winindex].drawcnt;I++)
        begin
            Winlist[Winindex].dofill =
                Winlist[Winindex].Drawn[I].drfill;
            Winlist[Winindex].Shape =
                Winlist[Winindex].Drawn[I].drshp;
            set_xfer_mode(Winlist[Winindex].Drawn[I].drmo);
            set_pattern(Winlist[Winindex].Drawn[I].drpat);
            set_color(Winlist[Winindex].Drawn[I].drcol);
            DrawShape(&(Winlist[Winindex].Drawn[I].drrct));
        end

        Flag = next_update(uprect,&Dummy);
    end

    Winlist[Winindex].dofill = tmpdofill;
    Winlist[Winindex].Shape = tmpshape;
    set_xfer_mode(Winlist[Winindex].winmode);
    set_pattern(Winlist[Winindex].winpat);
    set_color(Winlist[Winindex].wincol);

    end_update();
end

/*-----*/
/*-----*/

DrawShape(rct)

    Rect    *rct;

begin

    Int      Index;

```

```

Window_id    Active;

Active = get_active();
Index = Findindex(Active);

if (Winlist[Index].dofill)
begin
    switch (Winlist[Index].Shape)
    begin
        case ITRECT:
        begin
            fillrect(rct);
            break;
        end;

        case ITELLIP:
        begin
            fillellipse(rct);
            break;
        end;

        case ITARC90:
        begin
            fillarc(rct,0,900);
            break;
        end;

        case ITARC180:
        begin
            fillarc(rct,0,1800);
            break;
        end;

        case ITARC270:
        begin
            fillarc(rct,0,2700);
            break;
        end;

        case ITRNDRCT:
        begin
            fillrndrct(rct);
            break;
        end;

        default:      break;
    end
end

else
begin

```

```

switch (Winlist[Index].Shape)
begin

    case ITRECT:
    begin
        drawrect(rct);
        break;
    end;

    case ITELLIP:
    begin
        drawellipse(rct);
        break;
    end;

    case ITARC90:
    begin
        drawarc(rct,0,900);
        break;
    end;

    case ITARC180:
    begin
        drawarc(rct,0,1800);
        break;
    end;

    case ITARC270:
    begin
        drawarc(rct,0,2700);
        break;
    end;

    case ITRNDRCT:
    begin
        drawrndrct(rct);
        break;
    end;

    default:      break;

```

```

end

```

```

end

```

```

end

```

```

/*-----*/
/*-----*/

```

```

DoMouseDown(p1,mod)

```

```

    Point  *p1;

```



```

int      mod;

begin

    Point      p2,p3;
    Rect       tempr;
    Color_id   tempcol;
    Mode_id    tempmode;
    Pattern_id temppat;
    Int        Index;
    Int        Drcnt;
    Window_id  Active;

    Active = get_active();
    Index = Findindex(Active);

    if (!Winlist[Index].doline)
    begin

        copypt(*p1,&p2);
        tempmode = get_xfer_mode();
        set_xfer_mode(XOR);
        tempcol = get_color();
        set_color(LTBLACK);
        temppat = get_pattern();
        set_pattern(HATCH);

        set_rect(p1,&p2,&tempr);
        drawrect(&tempr);

        while (!mouse_up())
        begin
            get_mouse(Winlist[Index].winid,&p3);

            if (!equalpt(&p2,&p3))
            begin
                drawrect(&tempr);
                set_rect(p1,&p3,&tempr);
                drawrect(&tempr);
                copypt(p3,&p2);
            end
        end

        drawrect(&tempr);
        set_xfer_mode(tempmode);
        set_color(tempcol);
        set_pattern(temppat);

        if (!equalpt(p1,&p2))
        begin
            DrawShape(&tempr);
            Drcnt = Winlist[Index].drawcnt;

```

```

        copyrect(temp,
            &(Winlist[Index].Drawn[Drcnt].drrct));

        Winlist[Index].Drawn[Drcnt].drfill =
            Winlist[Index].dofill;

        Winlist[Index].Drawn[Drcnt].drshp =
            Winlist[Index].Shape;

        Winlist[Index].Drawn[Drcnt].drmo = tempmode;
        Winlist[Index].Drawn[Drcnt].drpat = temppat;
        Winlist[Index].Drawn[Drcnt].drcol = tempcol;
        Winlist[Index].drawcnt =
            (Winlist[Index].drawcnt + 1) % NUMDR;
    end

    else
        txtpen(p1);
    end

    else
    begin
        copypt(*p1,&p2);

        while (!mouse_up())
        begin
            get_mouse(Winlist[Index].winid,&p3);

            if (!equalpt(&p2,&p3))
            begin
                drawline(&p2,&p3);
                copypt(p3,&p2);
            end
        end
    end

    end

end

/*-----*/
/*-----*/
Void
ChDraw(itemnum)

    int    itemnum;

begin
    Int      Index;
    Window_id Active;

    Active = get_active();

    if (Active == DESK_WIN)
        return;

```

```
Index = Findindex(Active);
```

```
switch (itemnum)
```

```
begin
```

```
    case ITOUTLN:
```

```
    begin
```

```
        Winlist[Index].dofill = FALSE;
```

```
        item_mark(MNDRAW,ITOUTLN,TRUE);
```

```
        item_mark(MNDRAW,ITFILL,FALSE);
```

```
        break;
```

```
    end;
```

```
    case ITFILL:
```

```
    begin
```

```
        Winlist[Index].dofill = TRUE;
```

```
        item_mark(MNDRAW,ITOUTLN,FALSE);
```

```
        item_mark(MNDRAW,ITFILL,TRUE);
```

```
        break;
```

```
    end;
```

```
    case ITSHAPE:
```

```
    begin
```

```
        if (Winlist[Index].doline)
```

```
        begin
```

```
            Winlist[Index].doline = FALSE;
```

```
            item_enable(MNDRAW,ITOUTLN);
```

```
            item_enable(MNDRAW,ITFILL);
```

```
            item_enable(MNDRAW,ITRECT);
```

```
            item_enable(MNDRAW,ITELLIP);
```

```
            item_enable(MNDRAW,ITARC90);
```

```
            item_enable(MNDRAW,ITARC180);
```

```
            item_enable(MNDRAW,ITARC270);
```

```
            item_enable(MNDRAW,ITRNDRCT);
```

```
            item_mark(MNDRAW,ITSHAPE,TRUE);
```

```
            item_mark(MNDRAW,ITLINE,FALSE);
```

```
        end
```

```
        break;
```

```
    end;
```

```
    case ITLINE:
```

```
    begin
```

```
        if (!Winlist[Index].doline)
```

```
        begin
```

```
            Winlist[Index].doline = TRUE;
```

```
            item_disable(MNDRAW,ITOUTLN);
```

```
            item_disable(MNDRAW,ITFILL);
```

```
            item_disable(MNDRAW,ITRECT);
```

```
            item_disable(MNDRAW,ITELLIP);
```

```
            item_disable(MNDRAW,ITARC90);
```

```
            item_disable(MNDRAW,ITARC180);
```

```
            item_disable(MNDRAW,ITARC270);
```

```
            item_disable(MNDRAW,ITRNDRCT);
```

```

        item_mark(MNDRAW,ITSHAPE,FALSE);
        item_mark(MNDRAW,ITLINE,TRUE);
    end
    break;
end;

default:
begin
    item_mark(MNDRAW,Winlist[Index].Shape,FALSE);
    item_mark(MNDRAW,itemnum,TRUE);
    Winlist[Index].Shape = itemnum;
    break;
end;

end

end

/*-----*/
/*-----*/
ChMode(itemnum)

    int    itemnum;

begin
    Int      Index;
    Window_id Active;

    Active = get_active();

    if (Active == DESK_WIN)
        return;

    Index = Findindex(Active);

    switch (itemnum)
    begin

        case ITREPLCE:
        begin
            set_xfer_mode(REPLACE);
            break;
        end;

        case ITTRANS:
        begin
            set_xfer_mode(TRANSPAR);
            break;
        end;

        case ITXOR:
        begin
            set_xfer_mode(XOR);

```

```

        break;
    end;

    case ITREVTR:
    begin
        set_xfer_mode(REVTRANS);
        break;
    end;

    default:      break;

end

item_mark(MNMODE,Winlist[Index].selMod,FALSE);
item_mark(MNMODE,itemnum,TRUE);

Winlist[Index].selMod = itemnum;
Winlist[Index].winmode = get_xfer_mode();

end

/*-----*/
/*-----*/

ChColor(itemnum)

    int    itemnum;

begin

    int      darkinc;
    int      tempc;
    Int      Index;
    Window_id Active;

    Active = get_active();

    if (Active == DESK_WIN)
        return;

    Index = Findindex(Active);

    if (Winlist[Index].dodark)
        darkinc = DKWHITE;
    else
        darkinc = 0;

    switch (itemnum)
    begin

        case ITDARK:

```

```

begin
    item_mark(MNCOLOR,itemnum,TRUE);
    item_mark(MNCOLOR,ITLIGHT,FALSE);
    Winlist[Index].dodark = TRUE;
    tempc = get_color();
    tempc = (tempc % DKWHITE) + DKWHITE;
    set_color(tempc);
    break;
end;

case ITLIGHT:
begin
    item_mark(MNCOLOR,itemnum,TRUE);
    item_mark(MNCOLOR,ITDARK,FALSE);
    Winlist[Index].dodark = FALSE;
    tempc = get_color();
    tempc = (tempc % DKWHITE);
    set_color(tempc);
    break;
end;

case ITBLACK:
begin
    set_color(LTBLACK + darkinc);
    break;
end;

case ITWHITE:
begin
    set_color(LTWHITE + darkinc);
    break;
end;

case ITRED:
begin
    set_color(LTRED + darkinc);
    break;
end;

case ITGREEN:
begin
    set_color(LTGREEN + darkinc);
    break;
end;

case ITBLUE:
begin
    set_color(LTBLUE + darkinc);
    break;
end;

case ITCYAN:
begin
    set_color(LTCYAN + darkinc);

```



```

        break;
    end;

    case ITYELLOW:
    begin
        set_color(LTYELLOW + darkinc);
        break;
    end;

    case ITMAGENT:
    begin
        set_color(LTMAGENTA + darkinc);
        break;
    end;

    default:      break;

end

if ((itemnum != ITDARK) && (itemnum != ITLIGHT))
begin
    item_mark(MNCOLOR,Winlist[Index].selCol,FALSE);
    item_mark(MNCOLOR,itemnum,TRUE);
    Winlist[Index].selCol = itemnum;
end

Winlist[Index].wincol = get_color();
end

/*-----*/
/*-----*/

ChPattern(itemnum)

    int    itemnum;

begin
    Int      Index;
    Window_id  Active;

    Active = get_active();

    if (Active == DESK_WIN)
        return;

    Index = Findindex(Active);

    switch (itemnum)
    begin
        case ITSOLID:
        begin
            set_pattern(SOLID);
            break;

```

```

end;

case ITHVYHT:
begin
    set_pattern(HEAVYHATCH);
    break;
end;

case ITHATCH:
begin
    set_pattern(HATCH);
    break;
end;

case ITLTHAT:
begin
    set_pattern(LTHATCH);
    break;
end;

case IEMPTY:
begin
    set_pattern(EMPTY);
    break;
end;

default:      break;

end

item_mark(MNPATTRN,Winlist[Index].selPat,FALSE);
item_mark(MNPATTRN,itemnum,TRUE);

Winlist[Index].selPat = itemnum;
Winlist[Index].winpat = get_pattern();

end

```

```

/*-----*/
/*-----*/

```

```

Void
ChWin(itemnum)

    Int    itemnum;

begin
    Int      oldIndex;
    Int      Index;
    Window_id active;

    switch (itemnum)
    begin

```

```
case ITWIN1:
begin
    Index = 0;
    break;
end;

case ITWIN2:
begin
    Index = 1;
    break;
end;

case ITWIN3:
begin
    Index = 2;
    break;
end;

case ITWIN4:
begin
    Index = 3;
    break;
end;

case ITWIN5:
begin
    Index = 4;
    break;
end;

case ITWIN6:
begin
    Index = 5;
    break;
end;

case ITWIN7:
begin
    Index = 6;
    break;
end;

default:
begin
    Index = INVALID;
    return;
    break;
end;

end

if (Winlist[Index].Created)
begin
```

```

if (Winlist[Index].Visible)
begin
    hide_window(Winlist[Index].winid);
    Winlist[Index].Visible = FALSE;
    oldIndex = Index;

    active = get_active();
    Index = Findindex(active);

    if (active != DESK_WIN)
        ResetMenus(oldIndex,Index);
    else
        Lastactive = oldIndex;

    item_mark(MNWIN,itemnum,FALSE);
end

else
begin
    active = get_active();
    oldIndex = Findindex(active);
    show_window(Winlist[Index].winid);
    ResetMenus(oldIndex,Index);
    Winlist[Index].Visible = TRUE;
    item_mark(MNWIN,itemnum,TRUE);
end

end

else
begin
    active = get_active();
    oldIndex = Findindex(active);

    Winlist[Index].winid = set_new_window(&winrect,
        W_NAME | W_SIZE | W_CLOSE | W_HSCROLL | W_VSCROLL,
        Title[Index],TRUE);

    Winlist[Index].wincol = LTBLACK;
    Winlist[Index].winpat = SOLID;
    Winlist[Index].winmode = REPLACE;
    Winlist[Index].Shape = ITRECT;

    Winlist[Index].selPat = ITSOLID;
    Winlist[Index].selCol = ITBLACK;
    Winlist[Index].selMod = ITREPLCE;

    Winlist[Index].dodark = TRUE;
    Winlist[Index].dofill = FALSE;
    Winlist[Index].doline = FALSE;

    Winlist[Index].Created = TRUE;
    Winlist[Index].Visible = TRUE;

```

```

Winlist[Index].drawcnt = 0;

ResetMenus(oldIndex,Index);
item_mark(MNWIN,itemnum,TRUE);

end

end

/*-----*/
/*-----*/

DoMenu(menunum,itemnum)

int    menunum,itemnum;

begin
    switch (menunum)
    begin
        case MNDRAW:
        begin
            ChDraw(itemnum);
            menu_highlight(MNDRAW,FALSE);
            break;
        end;

        case MNMODE:
        begin
            ChMode(itemnum);
            menu_highlight(MNMODE,FALSE);
            break;
        end;

        case MNCOLOR:
        begin
            ChColor(itemnum);
            menu_highlight(MNCOLOR,FALSE);
            break;
        end;

        case MNPATTRN:
        begin
            ChPattern(itemnum);
            menu_highlight(MNPATTRN,FALSE);
            break;
        end;

        case MNWIN:
        begin
            ChWin(itemnum);
            menu_highlight(MNWIN,FALSE);
            break;
        end;
    end;
end;

```

```

        default:      break;

    end

end

/*-----*/
/*-----*/
    Void
DoKey(inchr,inmod)

    Char  inchr;
    Int   inmod;

begin
    Int   width;
    Int   height;
    Point Penloc;

    switch (inchr)
    begin

        case CARR_RET:
            begin
                height = get_hchar();
                set_txtpen(&Penloc);
                Penloc.h = 0;
                Penloc.v += height;
                txtpen(&Penloc);
                break;
            end;

        case BACK_SP:
            begin
                width = get_wchar();
                set_txtpen(&Penloc);
                Penloc.h -= width;
                txtpen(&Penloc);
                drawchar(BLANK);
                txtpen(&Penloc);
                break;
            end;

        default:
            begin
                if ((inchr >= BLANK) && (inchr <= '~'))
                    drawchar(inchr);
                break;
            end;

    end;

end

```


end

```
/*-----*/  
/*-----*/
```

evtloop()

begin

```
    Bool  Stop;  
    Int   Index;  
    Int   oldIndex;
```

```
    Stop = FALSE;
```

```
    while (!Stop)  
    begin
```

```
        get_event();
```

```
        switch (EVTTYPE)  
        begin
```

```
            case CLOSEWIN:  
            begin
```

```
                Stop = TRUE;  
                break;
```

```
            end;
```

```
            case SCROLLBAR:  
            begin
```

```
                DoScroll(EVTSCRPART,EVTSCRPOSN,  
                        EVTSCRMOVE);  
                break;
```

```
            end;
```

```
            case KEYBOARD:  
            begin
```

```
                DoKey(EVTKEY,EVTMOD);  
                break;
```

```
            end;
```

```
            case TOPPED:  
            begin
```

```
                if (EVTWINDOW != DESK_WIN)  
                begin
```

```
                    oldIndex = Findindex(get_active());  
                    Index = Findindex(EVTWINDOW);  
                    ResetMenus(oldIndex,Index);  
                    activate_win(EVTWINDOW);
```

```
                end  
                break;
```

```
            end;
```

```

        case MOUSEUP:      break;

        case MOUSEDOWN:
        begin
            if(EVTWINDOW != DESK_WIN)
                DoMouseDown(&(EVPOINT),EVTMOD);
            break;
        end;

        case REDRAW:
        begin
            DoUpdate(EVTWINDOW,&EVTRECT);
            break;
        end;

        case MENUHIT:
        begin
            DoMenu(EVTMTITLE,EVTMITEM);
            break;
        end;

        default:      break;

    end
end

/*-----*/
/*-----*/

ASMAIN()
begin

    sys_init();
    init_menu("TEST5.RSC",TEST5BAR);

    set_point(10,10,&Tl);
    set_point(300,300,&Br);
    set_rect(&Tl,&Br,&winrect);

    Winlist[0].winid = set_new_window(&winrect,
        W_NAME | W_SIZE | W_CLOSE | W_HSCROLL | W_VSCROLL,
        Title[0],TRUE);

    set_color(LTBLACK);
    set_pattern(SOLID);
    set_xfer_mode(REPLACE);

    Winlist[0].wincol = LTBLACK;
    Winlist[0].winpat = SOLID;
    Winlist[0].winmode = REPLACE;

```

```
Winlist[0].Shape = ITRECT;

Winlist[0].selPat = ITSOLID;
Winlist[0].selCol = ITBLACK;
Winlist[0].selMod = ITREPLCE;

Winlist[0].dodark = TRUE;
Winlist[0].dofill = FALSE;
Winlist[0].doline = FALSE;

Winlist[0].Created = TRUE;
Winlist[0].Visible = TRUE;
Winlist[0].drawcnt = 0;

evtloop();
sys_end();

end
```

```

/*-----*/
/*                                     */
/*                                     */
/*-----*/

/*-----*/
/* Interface Specifications for functions used to initialize the */
/* interface.                                                    */
/*-----*/

/* sys_init() */
extern State
    sys_init();

/* sys_end() */
extern State
    sys_end();

/*-----*/
/* Interface Specifications for functions used to manipulate the */
/* primitive data type point (in file Asprim.c).                */
/*-----*/

/* set_point(Horiz,Vert,&DestPoint) */
extern State
    set_point();

/* Horiz = get_x_coord(&InputPoint) */
extern Int
    get_x_coord();

/* Vertical = get_y_coord(&InputPoint) */
extern Int
    get_y_coord();

/* Flag = equalpt(&Point1,&Point2) */
extern Bool
    equalpt();

/* copypt(&SourcePoint,&DestPoint) */
extern State
    copypt();

/*-----*/
/* Interface Specifications for functions used to manipulate the */
/* primitive data type rectangle (in file Asprim.c).            */
/*-----*/

```

```

/* set_rect(&Point1,&Point2,&DestRect) */
extern State
    set_rect();

/* set_topLeft(&SourceRect,&DestPoint) */
extern State
    set_topLeft();

/* set_botRight(&SourceRect,&DestPoint) */
extern State
    set_botRight();

/* Flag = pt_in_rect(&QPoint,&TgtRect) */
extern Bool
    pt_in_rect();

/* set_insect_rect(&Rect1,&Rect2,&DestRect) */
extern State
    set_insect_rect();

/* Flag = insect_rect(&Rect1,&Rect2) */
extern Bool
    insect_rect();

/* Flag = equalrect(&Rect1,&Rect2) */
extern Bool
    equalrect();

/* copyrect(&SourceRect,&DestRect) */
extern State
    copyrect();

/*-----*/
/* Interface Specifications for functions used to manipulate */
/* windows as a whole entity. (in file Aswin.c). */
/*-----*/

/* set_new_window(&DefRect,Partspec,Titlestr, */
/*               Visible) */
extern Window_id
    set_new_window();

/* activate_win(WindowId) */
extern State
    activate_win();

/* hide_window(WindowId) */
extern State
    hide_window();

```

```

/* show_window(WindowId) */
extern State
show_window();

/* close_window(WindowId) */
extern State
close_window();

/* Flag = update_win(WindowId,&UpdRect,&InctRect)*/
extern Bool
update_win();

/*Flag = next_update(WindowId,&UpdRect,&InctRect)*/
extern Bool
next_update();

/* end_update() */
extern State
end_update();

/* WindowId = get_active() */
extern Window_id
get_active();

```

```

/*-----*/
/* Interface Specifications for functions used to manipulate the scroll */
/* bar portions of windows. (in file Aswin.c). */
/*-----*/

```

```

/* hscroll(NumberPixels,&UpdRect) */
extern State
hscroll();

/* vscroll(NumberPixels,&UpdRect) */
extern State
vscroll();

/* set_hscroll(Value) */
extern State
set_hscroll();

/* set_vscroll(Value) */
extern State
set_vscroll();

/* Value = get_hscroll() */
extern Int
get_hscroll();

/* Value = get_vscroll() */
extern Int

```



```

        get_vscroll();

/*-----*/
/* Interface Specifications for functions used to manipulate the*/
/* drawing environment of windows. (in file Aswin.c).           */
/*-----*/

        /* set_xfer_mode(NewModeId)                               */
extern State
        set_xfer_mode();

        /* set_pattern(NewPatternId)                             */
extern State
        set_pattern();

        /* set_color(NewColorId)                                 */
extern State
        set_color();

        /* ColorId = get_color()                                 */
extern Color_id
        get_color();

        /* ModeId = get_xfer_mode()                             */
extern Mode_id
        get_xfer_mode();

        /* Pattern_id = get_pattern()                             */
extern Pattern_id
        get_pattern();

/*-----*/
/* Interface Specifications for functions used for drawing graphic */
/* objects into windows. (in file Aswin.c).                       */
/*-----*/

        /* drawline(&StartPoint,&EndPoint)                       */
extern State
        drawline();

        /* drawrect(&InputRect)                                  */
extern State
        drawrect();

        /* drawellipse(&InputRect)                               */
extern State
        drawellipse();

        /* drawarc(&InputRect,BeginAng,EndAng) */

```

```

extern State
drawarc();

/* drawrndrect(&InputRect) */
extern State
drawrndrect();

/* fillrect(&InputRect) */
extern State
fillrect();

/* fillellipse(&InputRect) */
extern State
fillellipse();

/* fillarc(&InputRect,BeginAng,EndAng) */
extern State
fillarc();

/* fillrndrect(&InputRect) */
extern State
fillrndrect();

/*-----*/
/* Interface Specifications for functions used for text */
/* manipulation within windows. (in file Aswin.c). */
/*-----*/

/* txtpen(&InputPoint) */
extern State
txtpen();

/* set_txtpen(&DestPoint) */
extern State
set_txtpen();

/* drawstring(&String) */
extern State
drawstring();

/* drawchar(Character) */
extern State
drawchar();

/* CharWidth = get_wchar() */
extern Int
get_wchar();

/* CharHeight = get_hchar() */
extern Int
get_hchar();

```

```

/*-----*/
/* Interface Specifications for functions used to manipulate menus */
/* (in file Asmenu.c). */
/*-----*/

```

```

/* init_menu(&ResourceName,MenuBarId) */
extern State
    init_menu();

/* item_enable(MenuNumber,ItemNumber) */
extern State
    item_enable();

/* item_disable(MenuNumber,ItemNumber) */
extern State
    item_disable();

/* item_mark(MenuNum,ItemNum,ToMark) */
extern State
    item_check();

/* menu_hilight(MenuNum,ToHilight) */
extern State
    menu_hilight();

```

```

/*-----*/
/* Interface Specifications for event manager functions (in file */
/* Asevt.c). */
/*-----*/

```

```

/* get_event() */
extern State
    get_event();

/* get_mouse(WindowId,&DestPoint) */
extern State
    get_mouse();

/* Flag = mouse_up() */
extern Bool
    mouse_up();

```

APPENDIX B

Mac implementation of Common Interface

```
/*-----*/  
/*          ASBIND.H (for Demo.c use)          */  
/*-----*/
```

```
#include "MacTypes.h"
```

```
#define      begin      {  
#define      end        }
```

```
typedef      int         Bool;  
typedef      int         Int;  
typedef      char        Char;  
typedef      long        Long;  
typedef      unsigned int Bit16;
```

```
#define      State       void  
#define      Void        void
```

```
typedef      int         Pattern_id;  
typedef      int         Mode_id;  
typedef      int         Color_id;  
typedef      int         Window_id;
```

```
#define      W_NAME      0X0009  
#define      W_CLOSE     0X0002  
#define      W_SIZE      0x0020  
#define      W_HSCROLL   0x0E00  
#define      W_VSCROLL   0x01C0
```

```
#define      INVALID_WIN -1  
#define      DESK_WIN    0  
#define      MAXNUMWIN   7
```

```
#define      SOLID        1  
#define      HEAVYHATCH   2  
#define      HATCH        3  
#define      LTHATCH      4  
#define      EMPTY       5
```

```
#define      LTWHITE      0  
#define      LTBLACK      1  
#define      LTRED        2  
#define      LTGREEN      3  
#define      LTBLUE       4  
#define      LTCYAN       5  
#define      LTYELLOW     6  
#define      LTMAGENTA    7  
#define      DKWHITE      8
```

```

#define      DKBLACK      9
#define      DKRED        10
#define      DKGREEN      11
#define      DKBLUE       12
#define      DKCYAN        13
#define      DKYELLOW      14
#define      DKMAGENTA     15

#define      REPLACE       1
#define      TRANSPAR      2
#define      XOR            3
#define      REVTRANS       4

#define      FALSE         0x0000
#define      TRUE          0x0001

#define      POINTER(x)    (int)(x)
#define      ASMAIN()      main()

typedef      struct  Evtmsg
begin
    int      type;
    Window_id  winid;
    Rect      evrec;
    Point      evpoint;
    int      scrpart;
    int      scrposn;
    int      scrmoved;
    char      keystroke;
    int      mod;
    int      mtitle;
    int      mitem;
end          Evtmsg;

extern Evtmsg      Message;

#define      EVTTYPE      Message.type
#define      EVTWINDOW    Message.winid
#define      EVTRECT      Message.evrec
#define      EVPOINT      Message.evpoint
#define      EVTSCRPART   Message.scrpart
#define      EVTSCRPOSN   Message.scrposn
#define      EVTSCRMOVE   Message.scrmoved
#define      EVTKEY        Message.keystroke
#define      EVTMOD        Message.mod
#define      EVMTITLE      Message.mtitle
#define      EVMTITEM      Message.mitem

#define      REDRAW        0
#define      TOPPED        1
#define      CLOSEWIN      2
#define      SCROLLBAR     3
#define      MOUSEDOWN     4

```

#define	KEYBOARD	5
#define	MOUSEUP	6
#define	MENUHIT	7
#define	V_PAGEUP	0
#define	V_PAGEDOWN	1
#define	V_ROWUP	2
#define	V_ROWDOWN	3
#define	H_PAGEUP	4
#define	H_PAGEDOWN	5
#define	H_ROWUP	6
#define	H_ROWDOWN	7
#define	V_THUMB	8
#define	H_THUMB	9
#define	MINSR	0
#define	MAXSR	1000
#define	DESKMENU	32767
#define	NUL_CHR	'\0'
#define	CARR_RET	0x0D
#define	BACK_SP	0x08
#define	BLANK	0x20


```

/*-----*/
/*          DEMO.H  (for Demo.c use)          */
/*-----*/

```

```

#define      INVALID      -1

#define      TEST5BAR      12

#define      MNDRAW      13
#define      ITOUTLN      1
#define      ITFILL      2
#define      ITRECT      4
#define      ITELLIP      5
#define      ITARC90      6
#define      ITARC180      7
#define      ITARC270      8
#define      ITRNDRCT      9
#define      ITSHAPE      11
#define      ITLINE      12

#define      MNMODE      14
#define      ITREPLCE      1
#define      ITTRANS      2
#define      ITXOR      3
#define      ITREVTR      4

#define      MNCOLOR      15
#define      ITDARK      1
#define      ITLIGHT      2
#define      ITBLACK      4
#define      ITWHITE      5
#define      ITRED      6
#define      ITGREEN      7
#define      ITBLUE      8
#define      ITCYAN      9
#define      ITYELLOW      10
#define      ITMAGENT      11

#define      MNPATTRN      16
#define      ITSOLID      1
#define      ITHVYHT      2
#define      ITHATCH      3
#define      ITLTHAT      4
#define      ITEMPY      5

#define      MNWIN      20
#define      ITWIN1      1
#define      ITWIN2      2
#define      ITWIN3      3
#define      ITWIN4      4
#define      ITWIN5      5
#define      ITWIN6      6
#define      ITWIN7      7

```

```

/*-----*/
/*                      ASPRIM.C  (for Demo.c use)    */
/*-----*/

#include      "Asbind1.h"

/*-----*/
/* get_x_coord: Function which returns the horizontal  */
/*      coordinate of the input point pt.              */
/*-----*/

Int    get_x_coord(pt)

        Point  *pt;

begin
    return((*pt).h);
end

/*-----*/
/* get_y_coord: Function which returns the vertical coordinate */
/*      of the input point pt.                              */
/*-----*/

Int    get_y_coord(pt)

        Point  *pt;

begin
    return((*pt).v);
end

/*-----*/
/* set_topLeft: Function which returns the top left point of the */
/*      input rectangle r as p.                                    */
/*-----*/

State  set_topLeft(r,p)

        Rect   *r;
        Point  *p;

begin
    (*p).h = (*r).left;
    (*p).v = (*r).top;
end

/*-----*/
/* set_botRight: Function which returns the bottom right */
/*      point of the input rectangle r as p.              */
/*-----*/

State  set_botRight(r,p)

```

```

    Rect    *r;
    Point   *p;

begin
    (*p).h = (*r).right;
    (*p).v = (*r).bottom;
end

/*-----*/
/* pt_in_rect: Function which determines if the input point p is */
/*      within or on the border of the input rectangle r.      */
/*-----*/

Bool    pt_in_rect(p,r)

    Point   *p;
    Rect    *r;

begin
    return(PtInRect(*p, r));
end

/*-----*/
/* set_insect_rect: Function which determines the rectangle which */
/*      is formed by the intersection of the input rectangles r1 and r2. The */
/*      resulting rectangle is returned in rint. If the intersection is non- */
/*      empty, the rectangle returned in rint will be defined by top left and */
/*      bottom right points of (0,0). */
/*-----*/

State   set_insect_rect(r1,r2,rint)

    Rect    *r1, *r2, *rint;

begin
    SectRect(r1, r2, rint);
end

/*-----*/
/* insect_rect: Function which determines if the input */
/*      rectangles r1 and r2 intersect. */
/*-----*/

Bool    insect_rect(r1,r2)

    Rect            *r1, *r2;

begin
    Rect            *rint;

    return(SectRect(r1, r2, rint));
end

/*-----*/

```

```

/* equalrect: Function which determines if the two input      */
/* rectangles are the same rectangle.                          */
/*-----*/

Bool  equalrect(r1,r2)

    Rect      *r1, *r2;

begin
    return(EqualRect(r1, r2));
end

/*-----*/
/* equalpt: Function which determines if the two input points */
/* are the same point.                                         */
/*-----*/

Bool  equalpt(p1,p2)

    Point  *p1, *p2;

begin
    return(EqualPt(*p1,*p2));
end

/*-----*/
/* copypt: Function which copies the source point into the    */
/* destination point.                                           */
/*-----*/

State  copypt (source,dest)

    Point  source, *dest;

begin
    (*dest).h = source.h;
    (*dest).v = source.v;
end

/*-----*/
/* copyrect: Function which copies the source rectangle        */
/* into the destination rectangle.                              */
/*-----*/

State  copyrect (source,dest)

    Rect      source,*dest;

begin
    (*dest).left = source.left;
    (*dest).top = source.top;
    (*dest).right = source.right;
    (*dest).bottom = source.bottom;
end

```

```

/*-----*/
/* set_point: Given two integers which represent the x and y */
/* coordinates (the new horizontal and vertical positions */
/* of the point), the function returns a modified point. */
/*-----*/

```

State set_point(x,y,pt)

```

int      x,y;
Point *pt;

```

begin

```
SetPt(pt,x,y);
```

end

```

/*-----*/
/* set_rect: Function which, given two points, determines the smallest */
/* rectangle that those points could define and sets the top left and */
/* bottom right points of the output rectangle r to correspond to that */
/* rectangle. */
/*-----*/

```

State set_rect(p1,p2,r)

```

Point *p1,*p2;
Rect  *r;

```

begin

```

/* case 1 p2 is to the right and below p1 */
if (((*p2).h >= (*p1).h) && ((*p2).v >= (*p1).v))
    SetRect(r,(*p1).h, (*p1).v, (*p2).h, (*p2).v);

```

```

/* case 2 p1 is to the right and below p2 */
else if (((*p1).h >= (*p2).h) && ((*p1).v >= (*p2).v))
    SetRect(r, (*p2).h, (*p2).v, (*p1).h, (*p1).v);

```

```

/* case 3 p1 is to the right and above p2 */
else if (((*p1).h <= (*p2).h) && ((*p1).v >= (*p2).v))
    SetRect(r,(*p1).h, (*p2).v, (*p2).h, (*p1).v);

```

```

/* case 4 p2 is to the right and above p1 */
else if (((*p2).h <= (*p1).h) && ((*p2).v >= (*p1).v))
    SetRect(r,(*p2).h, (*p1).v, (*p1).h, (*p2).v);

```

end

```

/*-----*/
/*                               */
/*                               */
/*-----*/

```

```
#include "asevti.c"
```

```
State  get_event()
begin
```

```

    EventRecord      myEvent;
    PenState         thePen;
```

```

    evtstop = false;
    while (!evtstop) begin
```

```

        SystemTask();
        GetNextEvent(everyEvent, &myEvent);
        switch(myEvent.what) begin
        case mouseDown:
            MDEvent(myEvent);
            break;
```

```

        case autoKey:
        case keyDown:
            EVTTYPE = KEYBOARD;
            EVTKEY = (char)(0x7F & LoWord(myEvent.message));
            EVTMOD = myEvent.modifiers;
            evtstop = true;
            break;
```

```

        case updateEvt:
            EVTWINDOW = GetWRefCon(myEvent.message);
```

```

            SetRect(&EVTRECT,0,0,0,0);
            EVTTYPE = REDRAW;
            evtstop = true;
```

```

            SetPort(myEvent.message);
            GetPenState(&thePen);
            PenMode(patCopy);
            PenPat(black);
```

```

            SetOrigin(WindList[EVTWINDOW].Wholewin.top,
                      WindList[EVTWINDOW].Wholewin.left);
            ClipRect(&(WindList[EVTWINDOW].Wholewin));
```

```

            if ((WindList[EVTWINDOW].Parts & W_SIZE) == W_SIZE)
                DrawGrowIcon(WindList[EVTWINDOW].Winhandle);
```

```

            DrawControls(myEvent.message);
```

```

            SetOrigin(WindList[EVTWINDOW].Workwin.top,
                      WindList[EVTWINDOW].Workwin.left);
            ClipRect(&(WindList[EVTWINDOW].Workwin));
```



```

        SetPenState(&thePen);

        SetPort(WindList[Active_win].Winhandle);

        break;
    default:break;
    end
end
end

/*-----*/
/* get_mouse: Function which gets the current mouse position and outputs */
/* it in the local coordinate system of the window specified by Id. */
/*-----*/

State  get_mouse(Id,pt)

    Int      Id;
    Point    *pt;

begin
    GrafPtr    tempport;

    GetPort(&tempport);
    SetPort(WindList[Id].Winhandle);
    GetMouse(pt);
    SetPort(tempport);
end

/*-----*/
/*-----*/

Bool  mouse_up()

begin
    return(!Button());
end

```

```

/*-----*/
/*               ASEVTI.C               */
/*-----*/

```

```

#include "Windecl.h"

```

```

static   Bool           evtstop;
         Evtmsg         Message;
extern   Window_id      Active_win; /* index of active window */
extern   Winrec         WindList[MAXNUMREC];

```

```

State   MDEvent(event)

```

```

         EventRecord     event;

```

```

begin

```

```

         WindowPtr       MyWindow;
         Window_id       winID;
         Int             location;
         GrafPtr         tempport;
         ControlHandle    whscroll;
         Int             part,modpart,hval,vval;
         Rect            arect,brect;
         Long            amtmove;
         Long            menuresp;

```

```

         location = FindWindow(event.where,&MyWindow);

```

```

         if (MyWindow != NIL)

```

```

             EVTWINDOW = GetWRefCon(MyWindow);

```

```

         else

```

```

             EVTWINDOW = 0;

```

```

         if ((EVTWINDOW != Active_win)&&(location != inMenuBar)) begin

```

```

             GetPort(&tempport);
             SetPort(MyWindow);
             GlobalToLocal(&(event.where));

```

```

             EVTTYPE = TOPPED;
             EVTMOD = event.modifiers;
             copypt(event.where,&EVPOINT);
             SetPort(tempport);
             evtstop = true;

```

```

         end

```

```

         else

```

```

         begin

```

```

             switch (location)

```

```

             begin

```

```

                 case   inMenuBar:
                     menuresp = MenuSelect(event.where);
                     EVTMTITLE = HiWord(menuresp);
                     EVTMITEM = LoWord(menuresp);
                     EVTTYPE = MENUHIT;
                     evtstop = true;

```

```

        break;

case inContent:
    GetPort(&tempport);
    SetPort(MyWindow);

    copypt(event.where, &EVPOINT);
    SetOrigin(0,0);
    ClipRect(&(WindList[EVTWINDOW].Wholewin));

    GlobalToLocal(&(event.where));
    part = FindControl(event.where, MyWindow, &whscroll);

    if (part == 0) begin
        SetOrigin(WindList[EVTWINDOW].Workwin.left,
            WindList[EVTWINDOW].Workwin.top);
        ClipRect(&(WindList[EVTWINDOW].Workwin));
        GlobalToLocal(&EVPOINT);
        EVTTYPE = MOUSEDOWN;
        EVTMOD = event.modifiers;
        SetPort(tempport);
        evtstop = TRUE;
    end

    else if ((whscroll == WindList[EVTWINDOW].Hscrhandle) ||
        (whscroll == WindList[EVTWINDOW].Vscrhandle)) begin

        EVTTYPE = SCROLLBAR;
        hval = GetCtlValue(WindList[EVTWINDOW].Hscrhandle);
        vval = GetCtlValue(WindList[EVTWINDOW].Vscrhandle);

        modpart = TrackControl(whscroll, event.where, 0);

        if (modpart == part)
            begin
                if (whscroll == WindList[EVTWINDOW].Vscrhandle)
                    begin

                        switch (modpart)
                        begin

                            case inPageUp:
                                EVTSCRPART = V_PAGEUP;
                                break;

                            case inPageDown:
                                EVTSCRPART = V_PAGEDOWN;
                                break;

                            case inUpButton:
                                EVTSCRPART = V_ROWUP;
                                break;

```

```

        case inDownButton:
            EVTSCRPART = V_ROWDOWN;
            break;

        case inThumb:
            EVTSCRPART = V_THUMB;
            break;

        default: break;
    end

    EVTSCRMOVE =
        GetCtlValue(WindList[EVTWINDOW].Vscrhandle)
            - vval;

    EVTSCRPOSN =
        GetCtlValue(WindList[EVTWINDOW].Vscrhandle);
    SetCtlValue(WindList[EVTWINDOW].Vscrhandle,vval);
end

else
begin

    switch (modpart)
    begin

        case inPageUp:
            EVTSCRPART = H_PAGEUP;
            break;

        case inPageDown:
            EVTSCRPART = H_PAGEDOWN;
            break;

        case inUpButton:
            EVTSCRPART = H_ROWUP;
            break;

        case inDownButton:
            EVTSCRPART = H_ROWDOWN;
            break;

        case inThumb:
            EVTSCRPART = H_THUMB;
            break;

        default: break;
    end

    EVTSCRMOVE =
        GetCtlValue(WindList[EVTWINDOW].Hscrhandle)
            - hval;

```

```

        EVTSCRPOSN =
            GetCtlValue(WindList[EVTWINDOW].Hscrhandle);
        SetCtlValue(WindList[EVTWINDOW].Hscrhandle,hval);
    end

    end    /* if */

    SetOrigin(WindList[EVTWINDOW].Workwin.left,
        WindList[EVTWINDOW].Workwin.top);
    ClipRect(&(WindList[EVTWINDOW].Workwin));
    SetPort(tempport);
    evtstop = TRUE;
end    /* else */

break;

case inDrag:
    if (EVTWINDOW == Active_win)
    begin
        SetRect(&brect,-32000,20,32000,32000);
        DragWindow(MyWindow,event.where,&brect);

        SetOrigin(WindList[EVTWINDOW].Wholewin.left,
            WindList[EVTWINDOW].Wholewin.top);
        ClipRect(&(WindList[EVTWINDOW].Wholewin));

        if (WindList[EVTWINDOW].Parts & W_SIZE)
            DrawGrowIcon(MyWindow);

        DrawControls(MyWindow);

        SetOrigin(WindList[EVTWINDOW].Workwin.left,
            WindList[EVTWINDOW].Workwin.top);
        ClipRect(&(WindList[EVTWINDOW].Workwin));

    end
    break;

case inGrow:
    if (EVTWINDOW == Active_win)
    begin
        SetRect(&brect,40,40,1000,1000);

        SetOrigin(WindList[EVTWINDOW].Wholewin.left,
            WindList[EVTWINDOW].Wholewin.top);
        ClipRect(&(WindList[EVTWINDOW].Wholewin));

        amtmove = GrowWindow(MyWindow,event.where,
            &brect);

        hval = LoWord(amtmove);
        vval = HiWord(amtmove);
        copyrect(WindList[EVTWINDOW].Workwin,&brect);
        SizeWindow(MyWindow,hval,vval,FALSE);
    end
end

```

```

copyrect((*MyWindow).portRect,&(WindList[EVTWINDOW].Wholewin));

copyrect((*MyWindow).portRect,&(WindList[EVTWINDOW].Workwin));
copyrect((*MyWindow).portRect,&arect);
arect.right -= 16;
arect.bottom -= 16;
ClipRect(&(WindList[EVTWINDOW].Wholewin));

if (((WindList[EVTWINDOW].Parts & W_SIZE) > 0) &&
    (amtmove != 0))
begin
    DrawGrowIcon(MyWindow);
    WindList[EVTWINDOW].Workwin.bottom -= 16;
    WindList[EVTWINDOW].Workwin.right -= 16;
end
ClipRect(&arect);

if (((WindList[EVTWINDOW].Parts & W_HSCROLL) > 0)
    && (amtmove != 0))
begin
    SizeControl(WindList[EVTWINDOW].Hscrhandle,
        hval - 15,16);

    MoveControl(WindList[EVTWINDOW].Hscrhandle,
        WindList[EVTWINDOW].Wholewin.left,
        WindList[EVTWINDOW].Wholewin.bottom - 16);

    if (!((WindList[EVTWINDOW].Parts & W_SIZE) > 0))
        WindList[EVTWINDOW].Workwin.bottom -= 16;
    end

    if (((WindList[EVTWINDOW].Parts & W_VSCROLL) > 0)
        && (amtmove != 0))
    begin
        SizeControl(WindList[EVTWINDOW].Vscrhandle,
            16, vval - 15);
        MoveControl(
            WindList[EVTWINDOW].Vscrhandle, hval - 16,0);

        if (!((WindList[EVTWINDOW].Parts & W_SIZE) > 0))
            WindList[EVTWINDOW].Workwin.right -= 16;

    end

    ClipRect(&(WindList[EVTWINDOW].Wholewin));
    DrawControls(MyWindow);

    if (amtmove != 0)
        OffsetRect(&(WindList[EVTWINDOW].Workwin),
            brect.left,brect.top);
    else
        copyrect(brect,

```



```

                                &(WindList[EVTWINDOW].Workwin));

                                SetOrigin(WindList[EVTWINDOW].Workwin.left,
                                    WindList[EVTWINDOW].Workwin.top);
                                ClipRect(&(WindList[EVTWINDOW].Workwin));
                                InvalRect(&(WindList[EVTWINDOW].Workwin));
                                ValidRect(&brect);

                                end /* if */
                                break;

                                case inGoAway:
                                    if (TrackGoAway(MyWindow,event.where))
                                        begin
                                            EVTTYPE = CLOSEWIN;
                                            evtstop = TRUE;
                                        end

                                        break;

                                default: break;

                                end
                                end
                                end
end

```

```

/*-----*/
/*                               */
/*                               */
/*-----*/

```

```

#include      "Windecl.h"
#include      "aswini.c"

```

```

/*-----*/
/*-----*/

```

```

State  sys_end()

```

```

begin
    ExitToShell();
end

```

```

/*-----*/
/*-----*/

```

```

State  sys_init()

```

```

begin
    InitGraf(&thePort);
    InitFonts();
    FlushEvents(everyEvent, 0);
    InitWindows();
    InitMenus();
    TEFInit();
    InitDialogs(&sys_end);
    InitCursor();
    wind_init();
end

```

```

/*-----*/
/* activate_win: Function which causes the specified window to become */
/* the active window. It causes any window (but the desktop with a   */
/* id number of 0) to be moved to the top and a new background will    */
/* be drawn in, however, the contents will not be automatically        */
/* redrawn.                                                             */
/*-----*/

```

```

State  activate_win(Id)

```

```

    Int    Id;

```

```

begin

```

```

    if((Id != Active_win) && (Id != 25))
    begin

```

```

        /* if control bars present remove them from the window */
        /* being deactivated                                     */

```

```

        if (Active_win != DESK_WIN)

```

```

begin
    SetPort(WindList[Active_win].Winhandle);
    SetOrigin(WindList[Active_win].Wholewin.left,
              WindList[Active_win].Wholewin.top);
    ClipRect(&(WindList[Active_win].Wholewin));

    if ((WindList[Active_win].Parts & W_HSCROLL) ==
        W_HSCROLL)
        HideControl(WindList[Active_win].Hscrhandle);

    if ((WindList[Active_win].Parts & W_VSCROLL) ==
        W_VSCROLL)
        HideControl(WindList[Active_win].Vscrhandle);

end
/* Draw the grow box and scroll bars in the window being activated */

SelectWindow(WindList[Id].Winhandle);
Last_active = Active_win;
Active_win = Id;
SetPort(WindList[Id].Winhandle);

SetOrigin(WindList[Active_win].Wholewin.left,
          WindList[Active_win].Wholewin.top);
ClipRect(&(WindList[Active_win].Wholewin));

if ((WindList[Active_win].Parts & W_SIZE) == W_SIZE)
    DrawGrowIcon(WindList[Active_win].Winhandle);

if ((WindList[Active_win].Parts & W_HSCROLL) == W_HSCROLL)
    ShowControl(WindList[Active_win].Hscrhandle);

if ((WindList[Active_win].Parts & W_VSCROLL) == W_VSCROLL)
    ShowControl(WindList[Active_win].Vscrhandle);

SetOrigin(WindList[Active_win].Workwin.left,
          WindList[Active_win].Workwin.top);
ClipRect(&(WindList[Active_win].Workwin));

/* erase the grow box in the newly inactive window */
if (Last_active != DESK_WIN)
begin
    SetPort(WindList[Last_active].Winhandle);

    if ((WindList[Last_active].Parts & W_SIZE) == W_SIZE)
        DrawGrowIcon(WindList[Last_active].Winhandle);

    SetOrigin(WindList[Last_active].Workwin.left,
              WindList[Last_active].Workwin.top);
    ClipRect(&(WindList[Last_active].Workwin));

    SetPort(WindList[Id].Winhandle);

```

```

        end

    end

end

/*-----*/
/* show_window: Function which draws an invisible but previously defined */
/* window onto the screen. This window becomes the active window.      */
/*-----*/

State show_window(Id)

    Int    Id;

begin

    WindowPtr    tempptr;

    if (Id != DESK_WIN)
    begin
        if (!WindList[Id].Wdefrec.visible)
        begin
            ShowWindow(WindList[Id].Winhandle);
            activate_win(Id);
        end
    end
end

/*-----*/
/* hide_window: Function which removes the specified window */
/* from the screen without deallocating it.                  */
/*-----*/

State hide_window(Id)

    Int    Id;

begin

    WindowPtr    tempptr;
    Window_id    newactid;

    if ((Id != DESK_WIN) && (WindList[Id].Wdefrec.visible))
    begin
        HideWindow(WindList[Id].Winhandle);

        if ((Id == Active_win) && any_visible())
        begin
            tempptr = FrontWindow();
            newactid = GetWRefCon(tempptr);
            activate_win(newactid);
        end
    end
end

```

end

```
/*-----*/  
/*-----*/
```

Window_id set_new_window(InitRect, Partspec, Title, is_Visible)

```
Rect          *InitRect;  
Bit16         Partspec;  
Char          *Title;  
Boolean       is_Visible;
```

begin

```
Bool          IfWName;  
Bool          IfWClose;  
Bool          IfWSize;  
Bool          IfWScrollH;  
Bool          IfWScrollV;  
Bool          IfShrunk;  
Int           oldRef;  
Int           procID;  
WindowPtr     myWindow;  
Char          *Name,temp[255];  
Rect          vScrollRect,hScrollRect,tempWdef;
```

static Int refCon = 0; /* Reference constant for new window */

```
IfWName  = Partspec & W_NAME;  
IfWClose = Partspec & W_CLOSE;  
IfWSize  = Partspec & W_SIZE;  
IfWScrollH = Partspec & W_HSCROLL;  
IfWScrollV = Partspec & W_VSCROLL;
```

```
if (!get_next_rec(&refCon))  
    return(INVAL_WIN);
```

```
WindList[refCon].Parts = Partspec;  
SetPt(&(WindList[refCon].Txtpen),0,20);  
copyrect(*InitRect, &tempWdef);  
tempWdef.top += 20;  
OffsetRect(&tempWdef,0,20);
```

```
if (IfWSize)  
    procID = documentProc;  
else begin  
    if (IfWName || IfWClose)  
        procID = noGrowDocProc;  
    else  
        procID = plainDBox;  
end
```

```

if (IfWName) begin
    strcpy(temp,Title);
    CtoPstr(temp);
    Name = temp;
end else
    Name = "\p";
myWindow = NewWindow(&(WindList[refCon].Wdefrec), &tempWdef,
    Name, false, procID, NIL, IfWClose, refCon);
Available_win[refCon] = false;
WindList[refCon].Winhandle = myWindow;
SetPort(myWindow);

copyrect((*myWindow).portRect, &(WindList[refCon].Wholewin));
copyrect((*myWindow).portRect, &(WindList[refCon].Workwin));
if (IfWSize) begin
    IfShrunk = true;
    WindList[refCon].Workwin.bottom -= 17;
    WindList[refCon].Workwin.right -= 17;
end else IfShrunk = false;

if (IfWScrollH) begin
    copyrect(WindList[refCon].Wholewin, &hScrollRect);
    hScrollRect.top = hScrollRect.bottom-16;
    hScrollRect.right -= 15;
    WindList[refCon].Hscrhandle =
        NewControl(myWindow, &hScrollRect, "\p", false,
            MINSCR, MINSCR, MAXSCR,scrollBarProc,refCon);
    if (!IfShrunk)
        WindList[refCon].Workwin.bottom -= 16;
end else
    WindList[refCon].Hscrhandle = 0;

if (IfWScrollV) begin
    copyrect(WindList[refCon].Wholewin, &vScrollRect);
    vScrollRect.left = vScrollRect.right-16;
    vScrollRect.bottom -= 15;
    WindList[refCon].Vscrhandle =
        NewControl(myWindow, &vScrollRect, "\p", false,
            MINSCR,MINSCR, MAXSCR,scrollBarProc,refCon);
    if (!IfShrunk)
        WindList[refCon].Workwin.right -= 16;
end else WindList[refCon].Vscrhandle = 0;

ClipRect(&(WindList[refCon].Workwin));

WindList[refCon].wincol = LTBLACK;
WindList[refCon].winpat = SOLID;
WindList[refCon].winmode = REPLACE;
TextMode(srcBic);
TextFont(monaco);

if (is_Visible)
    show_window(refCon);
else

```



```

        SetPort(WindList[Active_win].Winhandle);
        return(refCon);

end

/*-----*/
/* set_pattern: Function which sets the pattern to be used to draw */
/* and fill in shapes in the active window. */
/*-----*/

State
set_pattern(newpattern)

    Pattern_id    newpattern;

begin

    if (((WindList[Active_win].wincol == DKWHITE) ||
        (WindList[Active_win].wincol == LTWHITE)) &&
        (WindList[Active_win].winmode == REPLACE))
        PenPat(black);

    else
    begin
        switch (newpattern)
        begin

            case HEAVYHATCH:
                PenPat(dkGray);
                break;

            case HATCH:
                PenPat(gray);
                break;

            case LTHATCH:
                PenPat(ltGray);
                break;

            case EMPTY:
                PenPat(white);
                break;

            default:
                PenPat(black);
                break;

        end
    end

    WindList[Active_win].winpat = newpattern;

end

/*-----*/

```

```

/* set_xfer_mode: function which will set the mode for drawing into      */
/* the active window.                                                    */
/*-----*/

```

State

set_xfer_mode(newmode)

Mode_id newmode;

begin

if ((WindList[Active_win].wincol == DKWHITE) ||
(WindList[Active_win].wincol == LTWHITE))

begin

switch (newmode)

begin

case TRANSPAR:
PenMode(patBic);
TextMode(srcBic);
break;

case XOR:
PenMode(patXor);
TextMode(srcXor);
break;

case REVTRANS:
PenMode(notPatBic);
TextMode(srcBic);
break;

default:
PenMode(notPatCopy);
TextMode(srcBic);
PenPat(black);
break;

end

end

else

begin

switch (newmode)

begin

case TRANSPAR:
PenMode(patOr);
TextMode(srcOr);
break;

case XOR:
PenMode(patXor);
TextMode(srcXor);
break;

```

        case REVTRANS:
            PenMode(notPatOr);
            TextMode(srcOr);
            break;

        default:
            PenMode(patCopy);
            TextMode(srcOr);
            break;
    end

    set_pattern(WindList[Active_win].winpat);
end

WindList[Active_win].winmode = newmode;
end

/*-----*/
/* set_color: Function which sets the global color for drawing. */
/*-----*/

State
set_color(newcolor)

    Int    newcolor;

begin

    Int    theColor;

    switch(newcolor)
    begin
        case LTBLACK:
        case DKBLACK:
            theColor = blackColor;
            break;
        case LTWHITE:
        case DKWHITE:
            theColor = whiteColor;
            break;
        case LTRED:
        case DKRED:
            theColor = redColor;
            break;
        case LTGREEN:
        case DKGREEN:
            theColor = greenColor;
            break;
        case LTBLUE:
        case DKBLUE:
            theColor = blueColor;
            break;
        case LTCYAN:

```

```

        case DKCYAN:
            theColor = cyanColor;
            break;
        case LTYELLOW:
        case DKYELLOW:
            theColor = yellowColor;
            break;
        case LTMAGENTA:
        case DKMAGENTA:
            theColor = magentaColor;
            break;
        default:break;
    end
    ForeColor(theColor);
    WindList[Active_win].wincol = newcolor;
end

```

```

/*-----*/
/* get_active: Function which returns the Id of the active window. */
/*-----*/

```

```

Window_id    get_active()

```

```

begin
    return(Active_win);
end

```

```

/*-----*/
/* drawline: Function which draws a line in the currently active window.*/
/* Input coordinates are relative to the top left hand corner of the */
/* active window. */
/*-----*/

```

```

State
drawline(St_pt,End_pt)

```

```

    Point    *St_pt,*End_pt;

```

```

begin
    MoveTo((*St_pt).h,(*St_pt).v);
    LineTo((*End_pt).h,(*End_pt).v);
end

```

```

/*-----*/
/* drawrect: Function to draw the outline of a rectangle in the active */
/* window. The coordinates of the input rectangle are asumed to be */
/* relative to the top left corner of the active window's work area. */
/*-----*/

```

```

State
drawrect(In_rect)

```

```

    Rect        *In_rect;

```

```
begin
```

```
    FrameRect(In_rect);
```

```
end
```

```
/*-----*/  
/* drawellipse: Function which draws an ellipse within the area of the */  
/* active window specified by the input rectangle. The coordinates */  
/* of the input rectangle are assumed to be relative to the top left */  
/* corner of the work area of the active window. */  
/*-----*/
```

```
    State  
drawellipse(In_rect)
```

```
    Rect          *In_rect;
```

```
begin
```

```
    FrameOval(In_rect);
```

```
end
```

```
/*-----*/  
/* drawarc: Function which draws an elliptical arc between the two */  
/* input angles (begang and endang) specified and within the */  
/* rectangular area of the active window specified. The input */  
/* rectangle is assumed to be relative to the top left corner of the */  
/* work area of the active window. */  
/*-----*/
```

```
    State  
drawarc(R,begang,endang)
```

```
    Rect          *R;  
    Int           begang,endang;
```

```
begin
```

```
    begang = (begang/10);  
    endang = (endang/10);
```

```
    FrameArc(R,begang,endang);
```

```
end
```

```
/*-----*/  
/* drawrndrect: Function which draws the outline of a rounded rectangle */  
/* within the specified rectangular area of the active window. */  
/*-----*/
```

```
    State  
drawrndrect(In_rect)
```

```

        Rect          *In_rect;

begin
    Int          width,height;

    width = RRWIDTH;
    height = RRHEIGHT;

    FrameRoundRect(In_rect,width,height);
end

/*-----*/
/* fillrect: Function which draws a pattern within the specified */
/*   rectangular area of the active window.                        */
/*-----*/

    State
fillrect(In_rect)

        Rect          *In_rect;

begin

    PaintRect(In_rect);

end

/*-----*/
/* fillellipse: Function which fills an ellipse within the area of the */
/*   active window specified by the input rectangle. The coordinates */
/*   of the input rectangle are assumed to be relative to the top left */
/*   corner of the work area of the active window.                    */
/*-----*/

    State
fillellipse(In_rect)

        Rect          *In_rect;

begin

    PaintOval(In_rect);

end

/*-----*/
/* fillarc: Function which fills an elliptical arc between the two */
/*   input angles (begang and endang) specified and within the */
/*   rectangular area of the active window specified. The input */
/*   rectangle is assumed to be relative to the top left corner of the */
/*   work area of the active window. Angles are reversed in the GEM */
/*   function call to force correspondence to Mac.                  */
/*-----*/

```



```
State
fillarc(R,begang,endang)
```

```
    Rect      *R;
    Int       begang,endang;
```

```
begin
    begang = (begang/10);
    endang = (endang/10);

    PaintArc(R,begang,endang);
end
```

```
/*-----*/
/* fillrndrect: Function which fills the outline of a rounded rectangle */
/* within the specified rectangular area of the active window. */
/*-----*/
```

```
State
fillrndrect(In_rect)
```

```
    Rect      *In_rect;
```

```
begin
    Int       width,height;

    width = RRWIDTH;
    height = RRHEIGHT;

    PaintRoundRect(In_rect,width,height);
end
```

```
/*-----*/
/* get_color: Function which returns the drawing color of the active */
/* window. */
/*-----*/
```

```
Color_id
get_color()
```

```
begin
    return(WindList[Active_win].wincol);
end
```

```
/*-----*/
/* get_pattern: Function which returns the drawing pattern of the active */
/* window. */
/*-----*/
```

```
Pattern_id
get_pattern()
```

```
begin
    return(WindList[Active_win].winpat);
end
```

end

```
/*-----*/  
/* get_xfer_mode: Function which returns the drawing transfer */  
/*      mode of the currently active window. */  
/*-----*/
```

Mode_id
get_xfer_mode()

begin
 return(WindList[Active_win].winmode);
end

```
/*-----*/  
/*      txtpen: Function which sets the location where */  
/*      the next call to drawchar or drawstring will place */  
/*      that string in the active window. */  
/*-----*/
```

State
txtpen(inpt)

Point *inpt;

begin
 copypt(*inpt,&(WindList[Active_win].Txtpen));
end

```
/*-----*/  
/* set_txtpen: Function which returns the location where */  
/*      the next call to drawchar or drawstring will place */  
/*      that string in the active window. */  
/*-----*/
```

State
set_txtpen(pen)

Point *pen;

begin
 copypt(WindList[Active_win].Txtpen,pen);
end

```
/*-----*/  
/* drawstring: Function which draws the input string into the active */  
/*      window. Note that at present, the MacIntosh Monaco font is */  
/*      used (see the initialization in set_new_window) and the string */  
/*      drawing transfer modes are limited to transparent and xor for */  
/*      the time being. */  
/*-----*/
```

```

        State
drawstring(strptr)

        Char   strptr[];

begin

        Char           *newstrptr;
        Char           tempstr[250];
        Int            length;

        length = strlen(strptr);
        strcpy(tempstr,strptr);

        *newstrptr = CtoPstr(tempstr);

        MoveTo(WindList[Active_win].Ttxtpen.h,WindList[Active_win].Ttxtpen.v);
        DrawString(newstrptr);

        GetPen(&(WindList[Active_win].Ttxtpen));

end

```

```

/*-----*/
/* drawchar: Function which draws the input character into the active */
/* window. Note that at present, the MacIntosh Monaco font is      */
/* used (see the initialization in set_new_window) and the string   */
/* drawing transfer modes are limited to transparent and xor for    */
/* the time being.                                                 */
/*-----*/

```

```

drawchar(inchr)

        Char   inchr;

begin

        MoveTo(WindList[Active_win].Ttxtpen.h,WindList[Active_win].Ttxtpen.v);
        DrawChar(inchr);

        GetPen(&(WindList[Active_win].Ttxtpen));

end

```

```

/*-----*/
/* get_wchar: Function which returns the width of the characters being */
/* drawn onto the screen. This function assumes that a MacIntosh      */
/* fixed width font (such as Monaco) is used for the interface.      */
/*-----*/

```

```

        Int

```

```
get_wchar()
```

```
begin
```

```
    FontInfo    info;  
    Int         height;
```

```
    GetFontInfo(&info);  
    return(info.widMax);
```

```
end
```

```
/*-----*/  
/* get_hchar: Function which returns the width of the */  
/* characters being drawn onto the screen.           */  
/*-----*/
```

```
    Int  
get_hchar()
```

```
begin
```

```
    FontInfo    info;  
    Int         height;
```

```
    GetFontInfo(&info);  
    height = info.ascent + info.descent + info.leading;  
    return(height);
```

```
end
```

```
/*-----*/  
/* close_window: Function which permanently closes the specified */  
/* window and deallocates its window record.                     */  
/*-----*/
```

```
    State  
close_window(Id)
```

```
    Window_id   Id;
```

```
begin
```

```
    Int         Recnum;
```

```
        /* determine if the window id refers to */  
        /* a declared window                      */
```

```
    Available_win[Id] = true;  
        /* if so, dispose of it                    */
```

```
    hide_window(Id);  
    CloseWindow(WindList[Id].Winhandle);    /*user w record storage*/
```

end

```
/*-----*/
/* update_win: Function which sets the system into the update window */
/* mode. In this mode, drawing will be limited to the visible region */
/* of the window to be updated (as identified by the ID number input) */
/* to the function. When given an rectangular area to update, the */
/* update region will be replaced by this rectangle. Input of an */
/* empty rectangle signifies that the update is in response to a */
/* system generated update event. The programmer should not change */
/* the rectangle provided with the update event (by the event manager) */
/* but pass it on unmodified to this function. */
/*-----*/
```

Bool update_win(ID,Up_rct,Dr_rct)

Int ID;
Rect *Up_rct,*Dr_rct;

begin

WindowPtr tempport;
GetPort(&tempport);
SetPort(WindList[ID].Winhandle);

```
/* If the input rectangle is not empty indicating */
/* that the user is not responding to a system */
/* update event, make the input rectangle the */
/* update region. */
*/
```

if (!EmptyRect(Up_rct))
begin

ValidRect(&(WindList[ID].Workwin));
InvalRect(Up_rct);

end

if((!EmptyRgn(WindList[ID].Wdefrec.updateRgn)) && (!Update_in_prog))
begin

copyrect(WindList[ID].Workwin,Dr_rct);

SetOrigin(WindList[ID].Wholewin.left,
WindList[ID].Wholewin.top);
ClipRect(&(WindList[ID].Wholewin));

DrawControls(WindList[ID].Winhandle);

SetOrigin(WindList[ID].Workwin.left,
WindList[ID].Workwin.top);
ClipRect(&(WindList[ID].Workwin));

Update_in_prog = TRUE;
Last_active = Active_win;

```

        Active_win = ID;
        BeginUpdate(WindList[ID].Winhandle);
        EraseRgn((*WindList[ID].Winhandle).visRgn);
        return(TRUE);
    end

    else
    begin
        SetPort(tempport);
        Update_in_prog = FALSE;
        SetRect(Dr_rct,0,0,0,0);
        return(FALSE);
    end
end

/*-----*/
/* next_update: A dummy function in the MacIntosh implementation */
/* which always returns FALSE. */
/*-----*/

Bool  next_update(Up_rct,Dr_rct)

    Rect  *Up_rct,*Dr_rct;

begin
    SetRect(Dr_rct,0,0,0,0);
    return(FALSE);
end

/*-----*/
/* end_update: procedure to end the update mode and restore the */
/* clip area to match the active (topmost) window. */
/*-----*/

State  end_update()

begin
    if(Update_in_prog)
    begin
        EndUpdate(WindList[Active_win].Winhandle);
        Active_win = Last_active;
        SetPort(WindList[Active_win].Winhandle);
        Update_in_prog = FALSE;
    end
end

/*-----*/
/* hscroll: Function which scrolls the content area of the active window */
/* by the number of "pixels" specified by num. If the num is */
/* positive, the region will move to the left, and to the right if */
/* negative. */
/*-----*/

State  hscroll(num,Up_rect)

```



```

    Int          num;
    Rect         *Up_rect;

begin

    RgnHandle     Temprgn;

    SetRect(Up_rect,0,0,0,0);
    if(num != 0)
    begin

        Temprgn = NewRgn();
        ScrollRect(&(WindList[Active_win].Workwin),-num,0,Temprgn);
        OffsetRect(&(WindList[Active_win].Workwin),num,0);
        copyrect(WindList[Active_win].Workwin,Up_rect);

        if(num > 0)
            (*Up_rect).left = (*Up_rect).right - num;
        else
            (*Up_rect).right = (*Up_rect).left - num;

        SetOrigin(WindList[Active_win].Workwin.left,
                  WindList[Active_win].Workwin.top);
        ClipRect(&(WindList[Active_win].Workwin));
        DisposeRgn(Temprgn);
    end
end

/*-----*/
/* vscroll: Function which scrolls the content area of the active window */
/*   by the number of "pixels" specified by num.  If the num is */
/*   positive, the region will move up,and down if negative. */
/*-----*/

State  vscroll(num,Up_rect)

    Int          num;
    Rect         *Up_rect;

begin

    RgnHandle     Temprgn;

    SetRect(Up_rect,0,0,0,0);
    if(num != 0)
    begin

        Temprgn = NewRgn();
        ScrollRect(&(WindList[Active_win].Workwin),0,-num,Temprgn);
        OffsetRect(&(WindList[Active_win].Workwin),0,num);
        copyrect(WindList[Active_win].Workwin,Up_rect);

        if(num > 0)

```

```

                (*Up_rect).top = (*Up_rect).bottom - num;
            else
                (*Up_rect).bottom = (*Up_rect).top - num;

                SetOrigin(WindList[Active_win].Workwin.left,
                          WindList[Active_win].Workwin.top);
                ClipRect(&(WindList[Active_win].Workwin));
                DisposeRgn(Temprgn);
            end
        end

/*-----*/
/* get_hscroll: Function which returns the horizontal scroll bar value. */
/*-----*/

Int        get_hscroll()

begin
    if ((WindList[Active_win].Parts & W_HSCROLL) > 0)
        return(GetCtlValue(WindList[Active_win].Hscrhandle));
    else
        return(-1);
end

/*-----*/
/* get_vscroll: Function which returns the vertical scroll bar value. */
/*-----*/

Int        get_vscroll()

begin
    if ((WindList[Active_win].Parts & W_VSCROLL) > 0)
        return(GetCtlValue(WindList[Active_win].Vscrhandle));
    else
        return(-1);
end

/*-----*/
/* set_hscroll: Function which sets the value of the horizontal */
/* scroll bar of the active window to the input val. */
/*-----*/

State set_hscroll(val)

    Int    val;

begin
    if (val < MINSCR)
        val = MINSCR;
    else if (val > MAXSCR)
        val = MAXSCR;

    if (WindList[Active_win].Parts & W_HSCROLL)
        begin

```

```

        SetOrigin(0,0);
        ClipRect(&(WindList[Active_win].Wholewin));
        SetCtlValue(WindList[Active_win].Hscrhandle,val);
        SetOrigin(WindList[Active_win].Workwin.left,
            WindList[Active_win].Workwin.top);
        ClipRect(&(WindList[Active_win].Workwin));
    end
end

/*-----*/
/* set_vscroll: Function which sets the value of the vertical scroll */
/*   bar to the input val. */
/*-----*/

State  set_vscroll(val)

    Int    val;

begin
    if (val < MINSCR)
        val = MINSCR;
    else if (val > MAXSCR)
        val = MAXSCR;

    if (WindList[Active_win].Parts & W_VSCROLL)
        begin
            SetOrigin(0,0);
            ClipRect(&(WindList[Active_win].Wholewin));
            SetCtlValue(WindList[Active_win].Vscrhandle,val);
            SetOrigin(WindList[Active_win].Workwin.left,
                WindList[Active_win].Workwin.top);
            ClipRect(&(WindList[Active_win].Workwin));
        end
    end
end

```

```

/*-----*/
/*                      ASWINI.C                      */
/*-----*/

Window_id  Active_win;
Winrec     WindList[MAXNUMREC];
Window_id  Last_active;      /* index of previous active window */
Bool       Update_in_prog;   /* is update occuring             */
                                   /* array of available record indices */
Bool       Available_win[MAXNUMWIN];

/*-----*/
/*-----*/

State  wind_init()

begin

    Int          i;
    WindowPtr    Wmgr;

    GetPort(&Wmgr);

    WindList[DESK_WIN].Winhandle = Wmgr;
    WindList[DESK_WIN].Parts = 0;
    SetPt(&(WindList[DESK_WIN].Txbpen),0,0);

    Available_win[0] = false;
    for (i=1; i <= MAXNUMWIN; i++)
        Available_win[i] = true;

    Active_win = DESK_WIN;
    Last_active = DESK_WIN;
    Update_in_prog = false;

    WindList[Active_win].wincol = LTBLACK;
    WindList[Active_win].winpat = SOLID;
    WindList[Active_win].winmode = REPLACE;

end

/*-----*/
/*-----*/

Bool  get_next_rec(ref)

    Int    *ref;

begin

    Int    i;

    i = 1;
    while ((i <= MAXNUMWIN)&&(!Available_win[i]))
        i++;
    if (i > MAXNUMWIN)

```

```

        return(false);
    else begin
        *ref = i;
        return(true);
    end
end

/*-----*/
/* any_visible: Function which returns TRUE if any user defined */
/* window is visible on the screen. */
/*-----*/

Bool  any_visible()
begin
    Int    I;

    for (I = 0; I < MAXNUMWIN; I++)
    begin
        if (!Available_win[I])
        begin
            if (WindList[I].Wdefrec.visible)
                return(TRUE);
        end
    end

    return(FALSE);
end

```

```

/*-----*/
/*                               */
/*                               */
/*-----*/

#include      "Asbind1.h"

typedef      struct  Winrec      /* Window record structure (abs spec) */
begin
    WindowRecord      Wdefrec;  /* Mac window record structure */
    WindowPtr      Winhandle;  /* Mac window pointer(window Graf port)*/
    Rect      Wholewin;  /* Rectangle for work area + scroll bars */
    /* top left corner always at (0,0) local */
    Rect      Workwin;  /* Rectangle for work area - scroll bars */
    /* top left corner in sync with scrolled */
    /* picture */
    Bit16      Parts;  /* spec for parts included in window */
    ControlHandle      Hscrhandle;  /* handle for horizontal scroll bar */
    ControlHandle      Vscrhandle;  /* handle for vertical scroll bar */
    Point      Txtpten;  /* location to draw next text */
    Mode_id      winmode;  /* drawing transfer mode for window */
    Color_id      wincol;  /* drawing color for window */
    Pattern_id      winpat;  /* drawing pattern for window */
end Winrec;

```



```

/*-----*/
/*                               ASMENU.C                               */
/*-----*/

#include "asbind1.h"

/*-----*/
/*-----*/
State init_menu(filename,barid)

    Char    *filename;
    Int     barid;

begin
    Handle   barhand;
    MenuHandle deskhand;

    CtoPstr(filename);
    OpenResFile(filename);
    barhand = GetNewMBar(barid);
    if (barhand != 0)
    begin
        deskhand = GetMenu(DESKMENU);
        AddResMenu(deskhand, 'DRV R');
        SetMenuBar(barhand);
        DrawMenuBar();
    end
end

/*-----*/
/*-----*/

State  item_enable(menunum,itemnum)

    Int          menunum,itemnum;

begin
    MenuHandle   temphand;

    temphand = GetMHandle(menunum);
    EnableItem(temphand,itemnum);
end

/*-----*/
/*-----*/

State  item_disable(menunum,itemnum)

    Int          menunum,itemnum;

begin
    MenuHandle   temphand;

```

```

        temphand = GetMHandle(menunum);
        DisableItem(temphand,itemnum);
end

/*-----*/
/*-----*/

State  item_mark(menunum,itemnum,mark)

    Int    menunum,itemnum;
    Bool   mark;

begin
    Int          i;
    MenuHandle   temphand;

    if (itemnum==0) begin
        temphand = GetMHandle(menunum);
        for (i= 1;i<=CountMItems(temphand);i++)
            CheckItem(temphand,i,mark);
    end else begin
        temphand = GetMHandle(menunum);
        CheckItem(temphand,itemnum,mark);
    end
end

end

/*-----*/
/*-----*/

State  menu_hilight(menunum,hilight)

    Int    menunum;
    Bool   hilight;

begin
    if (hilight)
        HiliteMenu(menunum);
    else
        HiliteMenu(0);
end
end

```

```

/*-----*/
/*          ASBIND1.H          */
/*-----*/

#include "Quickdraw.h"
#include "WindowMgr.h"
#include "ControlMgr.h"
#include "MenuMgr.h"
#include "EventMgr.h"
#include "FontMgr.h"

#define      begin      {
#define      end        }
#define      NIL        0

typedef      int         Bool;
typedef      int         Int;
typedef      char        Char;
typedef      long        Long;
typedef      unsigned int Bit16;

#define      State      void
#define      Void       void

typedef      int         Pattern_id;
typedef      int         Mode_id;
typedef      int         Color_id;
typedef      int         Window_id;

#define      W_NAME      0X0009
#define      W_CLOSE     0X0002
#define      W_SIZE      0x0020
#define      W_HSCROLL   0x0E00
#define      W_VSCROLL   0x01C0

#define      INVALID_WIN -1
#define      DESK_WIN    0
#define      MAXNUMWIN   7
#define      MAXNUMREC   8

#define      SOLID        1
#define      HEAVYHATCH   2
#define      HATCH        3
#define      LTHATCH      4
#define      EMPTY       5

#define      LTWHITE      0
#define      LTBLACK      1
#define      LTRED        2
#define      LTGREEN      3
#define      LTBLUE       4
#define      LTCYAN       5
#define      LTYELLOW     6
#define      LTMAGENTA    7

```

```

#define      DKWHITE      8
#define      DKBLACK      9
#define      DKRED        10
#define      DKGREEN      11
#define      DKBLUE       12
#define      DKCYAN       13
#define      DKYELLOW     14
#define      DKMAGENTA    15

#define      REPLACE      1
#define      TRANSPAR     2
#define      XOR          3
#define      REVTRANS     4

#define      FALSE        0x0000
#define      TRUE         0x0001

#define      POINTER(x)   (int)(x)
#define      ASMAIN()     main()

typedef      struct  Evtmsg
begin
    int      type;
    Window_id  winid;
    Rect      evrec;
    Point     evpoint;
    int      scrpart;
    int      scrposn;
    int      scrmoved;
    char      keystroke;
    int      mod;
    int      mtitle;
    int      mitem;
end          Evtmsg;

#define      EVTTYPE      Message.type
#define      EVTWINDOW    Message.winid
#define      EVTRECT      Message.evrec
#define      EVPOINT      Message.evpoint
#define      EVTSCRPART   Message.scrpart
#define      EVTSCRPOSN   Message.scrposn
#define      EVTSCRMOVE   Message.scrmoved
#define      EVTKEY       Message.keystroke
#define      EVTMOD       Message.mod
#define      EVTMTITLE    Message.mtitle
#define      EVTMITEM     Message.mitem

#define      REDRAW       0
#define      TOPPED       1
#define      CLOSEWIN     2
#define      SCROLLBAR    3
#define      MOUSEDOWN    4

```

```

#define      KEYBOARD      5
#define      MOUSEUP      6
#define      MENUHIT      7

#define      V_PAGEUP      0
#define      V_PAGEDOWN    1
#define      V_ROWUP       2
#define      V_ROWDOWN     3
#define      H_PAGEUP      4
#define      H_PAGEDOWN    5
#define      H_ROWUP       6
#define      H_ROWDOWN     7
#define      V_THUMB       8
#define      H_THUMB       9

#define      MINSCR        0
#define      MAXSCR        1000

typedef      int           Menu_id;

#define      DESKMENU      32767

#define      RRHEIGHT      15
#define      RRWIDTH       15

#define      NUL_CHR       '\0'
#define      CARR_RET      0x0D
#define      BACK_SP       0x08
#define      BLANK         0x20

```

```

/*-----*/
/*          ASBIND.H (for Demo.c use)          */
/*-----*/

#define      begin  {
#define      end    }

typedef struct Point
begin
    int      v,h;
end
Point;

typedef struct Rect
begin
    Point    topLeft;
    Point    botRight;
end
Rect;

typedef      int      Bool;

#define      Void      /**/
#define      State     /**/

typedef      int          Int;
typedef      long         Long;
typedef      char         Char;
typedef      unsigned int  Bit16;

typedef      int      Pattern_id;
typedef      int      Mode_id;
typedef      int      Color_id;
typedef      int      Window_id;
typedef      int      Menu_id;

#define      W_NAME          0x0009
#define      W_CLOSE         0X0002
#define      W_SIZE          0x0020
#define      W_HSCROLL       0x0E00
#define      W_VSCROLL       0X01C0

#define      INVALID_WIN     -1
#define      DESK_WIN        0
#define      MAXNUMWIN       7

#define      SOLID            1
#define      HEAVYHATCH      2
#define      HATCH            3
#define      LTHATCH         4
#define      EMPTY           5

#define      LTWHITE          0

```



```

#define      LTBLACK      1
#define      LTRED        2
#define      LTGREEN      3
#define      LTBLUE       4
#define      LTCYAN       5
#define      LTYELLOW     6
#define      LTMAGENTA    7
#define      DKWHITE      8
#define      DKBLACK      9
#define      DKRED        10
#define      DKGREEN      11
#define      DKBLUE       12
#define      DKCYAN       13
#define      DKYELLOW     14
#define      DKMAGENTA    15

#define      REPLACE      1
#define      TRANSPAR     2
#define      XOR           3
#define      REVTRANS     4

#include     "portab.h"
#define      ASMAIN()     GEMAIN()

typedef     struct  Evtmsg
begin
    int      type;
    int      winid;
    Rect     evrec;
    Point    evpoint;
    int      scrpart;
    int      scrposn;
    int      scrmoved;
    char     keystroke;
    int      mod;
    int      mtitle;
    int      mitem;
end  Evtmsg;

extern Evtmsg      Message;

#define      EVTTYPE      Message.type
#define      EVTWINDOW    Message.winid
#define      EVTRECT      Message.evrec
#define      EVPOINT      Message.evpoint
#define      EVTSCRPART   Message.scrpart
#define      EVTSCRPOSN   Message.scrposn
#define      EVTSCRMOVE   Message.scrmoved
#define      EVTKEY        Message.keystroke
#define      EVTMOD        Message.mod
#define      EVTMTITLE     Message.mtitle
#define      EVTMITEM      Message.mitem

```

#define	REDRAW	0
#define	TOPPED	1
#define	CLOSEWIN	2
#define	SCROLLBAR	3
#define	MOUSEDOWN	4
#define	KEYBOARD	5
#define	MOUSEUP	6
#define	MENUHIT	7
#define	V_PAGEUP	0
#define	V_PAGEDOWN	1
#define	V_ROWUP	2
#define	V_ROWDOWN	3
#define	H_PAGEUP	4
#define	H_PAGEDOWN	5
#define	H_ROWUP	6
#define	H_ROWDOWN	7
#define	V_THUMB	8
#define	H_THUMB	9
#define	MINSR	0
#define	MAXSR	1000
#define	NUL_CHR	'\0'
#define	CARR_RET	0x0D
#define	BACK_SP	0x08
#define	BLANK	0x20

```

/*-----*/
/*          DEMO.H (for Demo.c use)          */
/*-----*/

```

```

#define INVALID      -1

#define TEST5BAR     0      /* TREE */

#define MNDRAW       4      /* OBJECT in TREE #0 */
#define ITOUTLN     20      /* OBJECT in TREE #0 */
#define ITFILL       21      /* OBJECT in TREE #0 */
#define ITRECT       23      /* OBJECT in TREE #0 */
#define ITARC90      27      /* OBJECT in TREE #0 */
#define ITARC180     26      /* OBJECT in TREE #0 */
#define ITARC270     25      /* OBJECT in TREE #0 */
#define ITRNDRCT     28      /* OBJECT in TREE #0 */
#define ITSHAPE      30      /* OBJECT in TREE #0 */
#define ITLINE       31      /* OBJECT in TREE #0 */

#define MNMODE       5      /* OBJECT in TREE #0 */
#define ITREPLCE     33      /* OBJECT in TREE #0 */
#define ITTRANS      34      /* OBJECT in TREE #0 */
#define ITXOR        35      /* OBJECT in TREE #0 */
#define ITREVTR      36      /* OBJECT in TREE #0 */

#define MNCOLOR      6      /* OBJECT in TREE #0 */
#define ITDARK       38      /* OBJECT in TREE #0 */
#define ITLIGHT      39      /* OBJECT in TREE #0 */
#define ITBLACK      41      /* OBJECT in TREE #0 */
#define ITWHITE      42      /* OBJECT in TREE #0 */
#define ITRED        43      /* OBJECT in TREE #0 */
#define ITGREEN      44      /* OBJECT in TREE #0 */
#define ITBLUE       45      /* OBJECT in TREE #0 */
#define ITCYAN       46      /* OBJECT in TREE #0 */
#define ITYELLOW     47      /* OBJECT in TREE #0 */
#define ITMAGENT     48      /* OBJECT in TREE #0 */

#define MNPATTRN     7      /* OBJECT in TREE #0 */
#define ITSOLID      50      /* OBJECT in TREE #0 */
#define ITHVYHT      51      /* OBJECT in TREE #0 */
#define ITHATCH      52      /* OBJECT in TREE #0 */
#define ITLTHAT      53      /* OBJECT in TREE #0 */
#define ITEMPTY      54      /* OBJECT in TREE #0 */
#define ITELLIP      24      /* OBJECT in TREE #0 */

#define DESKMENU     3      /* OBJECT in TREE #0 */

#define MNWIN        8      /* OBJECT in TREE #0 */
#define ITWIN1       56      /* OBJECT in TREE #0 */
#define ITWIN2       57      /* OBJECT in TREE #0 */
#define ITWIN3       58      /* OBJECT in TREE #0 */
#define ITWIN4       59      /* OBJECT in TREE #0 */
#define ITWIN5       60      /* OBJECT in TREE #0 */

```

```
#define ITWIN6      61    /* OBJECT in TREE #0 */  
#define ITWIN7      62    /* OBJECT in TREE #0 */
```

```

/*-----*/
/*                               */
/*                               */
/*-----*/

#include      "asbind.h"
#include      "asprimi.c"

/*-----*/
/* Set_point: given two integers which represent the x and y */
/* coordinates (the horizontal and vertical positions of */
/* the point respectively), the function returns a point. */
/*-----*/
      State
set_point(x,y,pt)
      Int      x,y;
      Point    *pt;

begin
      pt -> h = x;
      pt -> v = y;
end

/*-----*/
/* get_x_coord: Function which returns the horizontal */
/* coordinate of the input point pt. */
/*-----*/
      Int
get_x_coord(pt)
      Point  *pt;

begin
      return (pt -> h);
end

/*-----*/
/* get_y_coord: Function which returns the vertical */
/* coordinate of the input point pt. */
/*-----*/
      Int
get_y_coord(pt)
      Point  *pt;

begin
      return(pt -> v);
end

/*-----*/
/* set_rect: Function which, given two points, determines the smallest */
/* rectangle that those points could define and sets the top left */
/* and bottom right points of the output rectangle r to correspond */
/*-----*/

```

```

/* to that rectangle. */
/*-----*/
    State
set_rect(p1,p2,r)
    Point *p1;
    Point *p2;
    Rect  *r;

begin
    /* case 1 p2 is to the right and below p1 */
    if (rt_below(p2,p1))
        assign_rect((p1 -> h),(p1 -> v),(p2 -> h),(p2 -> v),r);

    /* case 2 p1 is to the right and below p2 */
    else if (rt_below(p1,p2))
        assign_rect((p2 -> h),(p2 -> v), (p1 -> h),(p1 -> v),r);

    /* case 3 p1 is to the right and above p2 */
    else if (rt_above(p1,p2))
        assign_rect((p2 -> h),(p1 -> v),(p1 -> h),(p2 -> v),r);

    /* case 4 p2 is to the right and above p1 */
    else if (rt_above(p2,p1))
        assign_rect((p1 -> h),(p2 -> v),(p2 -> h),(p1 -> v),r);

end

/*-----*/
/* set_topLeft: Function which returns the top left point of the input */
/* rectangle r as p. */
/*-----*/
    State
set_topLeft(r,p)
    Rect  *r;
    Point *p;

begin
    (p -> h) = (r -> topLeft).h;
    (p -> v) = (r -> topLeft).v;
end

/*-----*/
/* get_botRight: Function which returns the bottom right point of the */
/* input rectangle r as p. */
/*-----*/
    State
set_botRight(r,p)
    Rect  *r;
    Point *p;

begin

```

```

        (p -> h) = (r -> botRight).h;
        (p -> v) = (r -> botRight).v;
end

/*-----*/
/* pt_in_rect: Function which determines if the input point p is within */
/* or on the border of the input rectangle r. */
/*-----*/
    Bool
pt_in_rect(p,r)
    Point *p;
    Rect *r;

begin
    if ((rt_below(p,&(r -> topLeft))) && (lf_above(p,&(r -> botRight))))
        return(TRUE);
    else
        return(FALSE);
end

/*-----*/
/* set_insect_rect: Function which determines the rectangle */
/* which is formed by the intersection of the input rectangles r1 */
/* and r2. The resulting rectangle is returned in rint. If the */
/* intersection is empty, the rectangle returned in rint will be */
/* defined by a top left and bottom right point of (0,0). */
/*-----*/
    State
set_insect_rect(r1,r2,rint)
    Rect *r1;
    Rect *r2;
    Rect *rint;

begin
    if (insect_rect(r1,r2))
        begin
            if ((r1 -> topLeft).h >= (r2 -> topLeft).h)
                (rint -> topLeft).h = (r1 -> topLeft).h;
            else
                (rint -> topLeft).h = (r2 -> topLeft).h;

            if ((r1 -> topLeft).v >= (r2 -> topLeft).v)
                (rint -> topLeft).v = (r1 -> topLeft).v;
            else
                (rint -> topLeft).v = (r2 -> topLeft).v;

            if ((r1 -> botRight).h <= (r2 -> botRight).h)
                (rint -> botRight).h = (r1 -> botRight).h;
            else
                (rint -> botRight).h = (r2 -> botRight).h;

```



```

        if ((r1 -> botRight).v <= (r2 -> botRight).v)
            (rint -> botRight).v = (r1 -> botRight).v;
        else
            (rint -> botRight).v = (r2 -> botRight).v;
    end

    else
        assign_rect(0,0,0,0,rint);
    end

end

/*-----*/
/* insect_rect: Function which determines whether the two input */
/* rectangles r1 and r2 intersect. */
/*-----*/
    Bool
insect_rect(r1,r2)
    Rect *r1;
    Rect *r2;

begin
    if (((r1 -> topLeft).h > (r2 -> botRight).h) ||
        ((r2 -> topLeft).h > (r1 -> botRight).h))
        return(FALSE);

    else if (((r1 -> topLeft).v > (r2 -> botRight).v) ||
             ((r2 -> topLeft).v > (r1 -> botRight).v))
        return(FALSE);

    else
        return(TRUE);
end

/*-----*/
/* equalpt: Function which determines if the two input points are the */
/* same point. */
/*-----*/
    Bool
equalpt(p1,p2)
    Point *p1;
    Point *p2;

begin
    if (((p1 -> h) == (p2 -> h)) && ((p1 -> v) == (p2 -> v)))
        return(TRUE);
    else
        return(FALSE);
end

```

```

/*-----*/
/* equalrect: Function which determines if the two input rectangles are */
/*   same rectangle. */
/*-----*/
    Bool
equalrect(r1,r2)
    Rect  *r1;
    Rect  *r2;

begin
    if ((equalpt(&(r1 -> topLeft),&(r2 -> topLeft))) &&
        (equalpt(&(r1 -> botRight),&(r2 -> botRight))))
        return(TRUE);
    else
        return(FALSE);
end

/*-----*/
/* copypt: Function which copies the source point into the destination */
/*   point. */
/*-----*/
    State
copypt(source,dest)

    Point  *source,*dest;

begin
    (*dest).h = (*source).h;
    (*dest).v = (*source).v;
end

/*-----*/
/* copyrect: Function which copies the source rectangle into the */
/*   destination rectangle. */
/*-----*/
    State
copyrect(source,dest)

    Rect  *source,*dest;

begin
    copypt(&((*source).topLeft),&((*dest).topLeft));
    copypt(&((*source).botRight),&((*dest).botRight));
end

```

```

/*-----*/
/*                               */
/*                               */
/*-----*/

```

```

/*-----*/
/* rt_below: Function which determines whether the point p1 is to the */
/* right of and below the point p2. Note: the larger the h, the */
/* farther right the point is and the larger the v the farther */
/* below the point is. */
/*-----*/

```

```

    Bool
rt_below(p1,p2)
    Point *p1;
    Point *p2;

begin
    if (((p1 -> h) >= (p2 -> h)) && ((p1 -> v) >= (p2 -> v)))
        return(TRUE);
    else
        return(FALSE);
end

```

```

/*-----*/
/* rt_above: Function which determines whether the point p1 is to the */
/* right and above point p2. */
/*-----*/

```

```

    Bool
rt_above(p1,p2)
    Point *p1;
    Point *p2;

begin
    if (((p1 -> h) >= (p2 -> h)) && ((p1 -> v) <= (p2 -> v)))
        return(TRUE);
    else
        return(FALSE);
end

```

```

/*-----*/
/* lf_above: Function to determine if point p1 is to the left and above */
/* point p2. */
/*-----*/

```

```

    Bool
lf_above(p1,p2)
    Point *p1;
    Point *p2;

begin
    if (((p1 -> h) <= (p2 -> h)) && ((p1 -> v) <= (p2 -> v)))
        return(TRUE);

```

```

        else
            return(FALSE);
    end

/*-----*/
/* If_below: Function to determine if point p1 is to the left and below */
/* point p2. */
/*-----*/
    Bool
    If_below(p1,p2)
        Point *p1;
        Point *p2;

    begin
        if (((p1 -> h) <= (p2 -> h)) && ((p1 -> v) >= (p2 -> v)))
            return(TRUE);
        else
            return(FALSE);
        end
    end

/*-----*/
/* assign_rect: Function to assign the values of the top left point and */
/* bottom right point of the rectangle r. Warning: the top left */
/* point as determined by xtop and ytop MUST be to the left and */
/* above the bottom right point as specified by xbot and ybot. */
/* This function is provided as a short form rectangle builder for */
/* the implementer only. */
/*-----*/
    State
    assign_rect(xtop,ytop,xbot,ybot,r)
        Int xtop,ytop,xbot,ybot;
        Rect *r,

    begin
        (r -> topLeft).h = xtop;
        (r -> topLeft).v = ytop;
        (r -> botRight).h = xbot;
        (r -> botRight).v = ybot;
    end
end

```

```

/*-----*/
/*                ASEVT.C                */
/*-----*/

```

```

State
get_event()

```

```

begin

```

```

    Bool    Stop;
    Int      outarr[4];
    Int      buffer[8];
    Int      tempx;
    Int      tempy;
    Int      mouseX;
    Int      mouseY;
    Int      buttonstate;
    Int      modifiers;
    Int      keybdreturn;
    Int      numstroke;

```

```

    U_int    evvector;

```

```

    Stop = FALSE;
    while(!Stop)
    begin

```

```

        /* look for a GEM keyboard,button */
        /* or message event                */

```

```

        evvector = evnt_multi
        (MU_KEYBD | MU_BUTTON | MU_MESAG, /* keyboard,button,message
events*/
        1,                                /* single button stroke */
        0x0001,                           /* leftmost button      */
        button_flag,                       /* look for mouse down or up */
        0x0000,                           /* return on exit       */
        0,                                 /* empty rect spec      */
        0,
        0,
        0,
        0,
        0x0000,                           /* return on exit       */
        0,                                 /* empty rect spec      */
        0,
        0,
        0,
        ADDR(buffer),                     /* address of message buffer */
        17,                               /* 17/1000 sec delay for */
        00,                               /* timer event (60 th sec) */
        &mouseX,                          /* X mouse position      */
        &mouseY,                          /* Y mouse position      */
        &buttonstate,                    /* button state          */
        &modifiers,                      /* keyboard modifiers     */

```

```

&keybdreturn,          /* unmodified key code      */
&numstroke);           /* number of button strokes */

                        /* GEM message event handler */

wind_update(1);
if ((evvector & MU_MESAG) == MU_MESAG)
begin
    switch (buffer[0])
    begin

        /* Menu hit event */

    case MN_SELECTED:
    begin

        EVTTYPE = MENUHIT;
        EVTMTITLE = buffer[3];
        EVTMITEM = buffer[4];

        /* insure only one title hilited*/
        if (mhilighted > 0)
            menu_tnormal(baraddr,mhilighted,TRUE);

        mhilighted = EVTMTITLE;
        Stop = TRUE;
        break;

    end;

        /* Redraw event      -- give program */
        /* rectangle to redraw */

    case WM_REDRAW:
    begin

        windowID(buffer[3],&EVTWINDOW);
        do_rev_map(&(Winlist[EVTWINDOW].Coordmap),
            &buffer[4],&buffer[5]);
        buffer[6] += buffer[4] - 1;
        buffer[7] += buffer[5] - 1;

        EVTTYPE = REDRAW;
        assign_rect(buffer[4],buffer[5],buffer[6],
            buffer[7],&EVTRECT);
        Stop = TRUE;
        break;

    end;

        /* Topped event */

    case WM_TOPPED:
    begin
        windowID(buffer[3],&EVTWINDOW);

```

```

        do_rev_map(&(Winlist[EVTWINDOW].Coordmap),
                    &mouseX,&mouseY);
        set_point(mouseX,mouseY,&EVPOINT);
        EVTTYPE = TOPPED;
        EVTMOD = modifiers;
        Stop = TRUE;
        break;
end;

/* Close box event */

case WM_CLOSED:
begin
    windowID(buffer[3],&EVTWINDOW);
    EVTTYPE = CLOSEWIN;
    Stop = TRUE;
    break;
end;

/* Scroll bar event where one
/* of the up or down arrows or
/* page up or down areas was
/* selected. */

case WM_ARROWED:
begin
    windowID(buffer[3],&EVTWINDOW);
    EVTTYPE = SCROLLBAR;
    EVTSCRPART = buffer[4];
    Stop = TRUE;
    break;
end;

/* Scroll bar event where the
/* user selected the slide (or
/* thumb) for the horizontal
/* scroll bar. */

case WM_HSLID:
begin
    windowID(buffer[3],&EVTWINDOW);
    EVTTYPE = SCROLLBAR;
    EVTSCRPART = H_THUMB;
    EVTSCRPOSN = buffer[4];
    EVTSCRMOVE = buffer[4] -
                    Winlist[EVTWINDOW].H_value;
    Stop = TRUE;
    break;
end;

/* Scroll bar event where the
/* user selected the slide (or
/* thumb) for the vertical

```



```

/* scroll bar. */

case WM_VSLID:
begin
    windowID(buffer[3],&EVTWINDOW);
    EVTTYPE = SCROLLBAR;
    EVTSCRPART = V_THUMB;
    EVTSCRPOSN = buffer[4];
    EVTSCRMOVE = buffer[4] -
        Winlist[EVTWINDOW].V_value;
    Stop = TRUE;
    break;
end;

/* Change the size of the window */
/* if the user has dragged the */
/* grow box. */

case WM_SIZED:
begin
    windowID(buffer[3],&EVTWINDOW);
    wind_set(buffer[3],WF_CXYWH,buffer[4],
        buffer[5],buffer[6],buffer[7]);

    Winlist[EVTWINDOW].defX = buffer[4];
    Winlist[EVTWINDOW].defY = buffer[5];
    Winlist[EVTWINDOW].defW = buffer[6];
    Winlist[EVTWINDOW].defH = buffer[7];

    wind_get(buffer[3],WF_WXYWH,&buffer[4],
        &buffer[5],&buffer[6],&buffer[7]);

    outarr[0] = buffer[4];
    outarr[1] = buffer[5];
    outarr[2] = buffer[4] + buffer[6] - 1;
    outarr[3] = buffer[5] + buffer[7] - 1;

    vs_clip(Device,1,outarr);

    break;
end;

/* Move the window if the user */
/* has dragged the title bar. */

case WM_MOVED:
begin
    windowID(buffer[3],&EVTWINDOW);
    wind_set(buffer[3],WF_CXYWH,buffer[4],
        buffer[5],buffer[6],buffer[7]);

    Winlist[EVTWINDOW].defX = buffer[4];
    Winlist[EVTWINDOW].defY = buffer[5];

```

```

Winlist[EVTWINDOW].defW = buffer[6];
Winlist[EVTWINDOW].defH = buffer[7];

wind_get(buffer[3],WF_WXYWH,&buffer[4],
        &buffer[5],&buffer[6],&buffer[7]);

outarr[0] = buffer[4];
outarr[1] = buffer[5];
outarr[2] = buffer[4] + buffer[6] - 1;
outarr[3] = buffer[5] + buffer[7] - 1;

vs_clip(Device,1,outarr);

get_origin(EVTWINDOW,&tempx,&tempy);
set_map(&(Winlist[EVTWINDOW].Coordmap),tempx,
        tempy,outarr[0],outarr[1]);

break;
end;

default: break;

end
end

/* Case for mouse down and */
/* mouse up events          */

else if ((evvector & MU_BUTTON) == MU_BUTTON)
begin
    if (button_flag == LOOKMDOWN)
    begin
        EVTTYPE = MOUSEDOWN;
        button_flag = LOOKMUP;
    end

    else
    begin
        EVTTYPE = MOUSEUP;
        button_flag = LOOKMDOWN;
    end

    EVTMOD = modifiers;
    tempx = wind_find(mouseX,mouseY);
    windowID(tempx,&EVTWINDOW);
    do_rev_map(&(Winlist[EVTWINDOW].Coordmap),&mouseX,
        &mouseY);

    Stop = TRUE;
    set_point(mouseX,mouseY,&(EVPOINT));

end
end

```

```

/* Case for keyboard event */

else if ((evvector & MU_KEYBD) == MU_KEYBD)
begin
    EVTTYPE = KEYBOARD;
    EVTKEY = ((Char)(keybdreturn & 0x007F));
    EVTMOD = modifiers;
    Stop = TRUE;
    evvector = evvector ^ MU_KEYBD;
end
wind_update(0);
end

/*-----*/
/* get_mouse: Function which reports the current location of the cursor */
/* in the local coordinates of the window specified by Id. */
/*-----*/
State
get_mouse(Id,pt)

    Int    Id;
    Point  *pt;

begin
    Int    x,y,button,mod;

    graf_mkstate(&x,&y,&button,&mod);

    do_rev_map(&(Winlist[Id].Coordmap),&x,&y);
    set_point(x,y,pt);
end

/*-----*/
/* mouse_up: Function which reports of the mouse button is up or not. */
/* Use of this function will cause the event manager to look for */
/* the opposite mouse button state returned by this function. This */
/* is analogous to the Mac WaitMouseUp function which unqueues a */
/* mouse up event if detected. */
/*-----*/
Bool
mouse_up()

begin
    Int    x,y,button,mod;

    graf_mkstate(&x,&y,&button,&mod);
    button = button & 0x0001;

    if (!button)

```

```
        button_flag = LOOKMDOWN;
else
    button_flag = LOOKMUP;
return(!button);
end
```

```

/*-----*/
/*                      ASEVTI.C                      */
/*-----*/

/*-----*/
/* get_origin: Hidden function which returns the x and y coordinates of */
/* the top left corner of the work area (in local coordinates). */
/*-----*/
State
get_origin(Id,x,y)

    Window_id    Id;
    Int          *x,*y;

begin
    (*x) = Winlist[Id].Coordmap.Xorigin;
    (*y) = Winlist[Id].Coordmap.Yorigin;
end

/*-----*/
/* windowID: Hidden function which matches the input GEM handle to an */
/* abstract window id and returns it in the Id parameter. The */
/* return indicates whether or not a successful match was made. */
/*-----*/

Bool
windowID(handle,Id)

    Int          handle;
    Window_id    *Id;

begin

    Int    I;

    (*Id) = 10;
    I = 0;

    if (handle == 0)
    begin
        (*Id) = 0;
        return(TRUE);
    end

    while (I <= 8)
    begin

        if (Alloc_win[I] != 0)
        begin
            if (Winlist[Alloc_win[I]].Winhandle == handle)
                (*Id) = Alloc_win[I];
        end
    end
end

```

```
        I++;  
    end  
    if ((*Id) == 10)  
        return(FALSE);  
    else  
        return(TRUE);  
end
```



```

/*-----*/
/*                      ASWIN.C                      */
/*-----*/

#include "ASBIND1.H"
#include "machine.h"
#include "obdefs.h"
#include "treeaddr.h"
#include "gembind.h"
#include "vdibind.h"

#include      "aswini.c"
#include      "asmenu.c"

/*-----*/
/* set_xfer_mode: function which will set the global mode for drawing      */
/*   onto the screen.                                                         */
/*-----*/
      State
set_xfer_mode(newmode)

      Mode_id      newmode;

begin
      if((newmode < REPLACE) || (newmode > REVTRANS))
          newmode = REPLACE;

      vswr_mode(Device,newmode);
      Winlist[Active_win].winmode = newmode;
end

/*-----*/
/* set_pattern: Function which sets the pattern to be used to draw          */
/*   and fill in shapes.                                                     */
/*-----*/
      State
set_pattern(newpattern)

      Pattern_id      newpattern;

begin
      switch (newpattern)
      begin

          case HEAVYHATCH:
              begin
                  vsl_type(Device,2);
                  vsf_interior(Device,2);
                  vsf_style(Device,7);
                  Winlist[Active_win].winpat = newpattern;
                  break;

```

```

end;

case HATCH:
begin
    vsl_type(Device,7);
    vsl_udsty(Device,0xE38E);
    vsf_interior(Device,2);
    vsf_style(Device,5);
    Winlist[Active_win].winpat = newpattern;
    break;
end;

case LTHATCH:
begin
    vsl_type(Device,3);
    vsf_interior(Device,2);
    vsf_style(Device,2);
    Winlist[Active_win].winpat = newpattern;
    break;
end;

case EMPTY:
begin
    vsl_type(Device,7);
    vsl_udsty(Device,0x0000);
    vsf_interior(Device,0);
    Winlist[Active_win].winpat = newpattern;
    break;
end;

default:
begin
    vsl_type(Device,1);
    vsf_interior(Device,1);
    Winlist[Active_win].winpat = SOLID;
    break;
end;
end
end

```

```

/*-----*/
/* set_color: Function which sets the global color for drawing. */
/*-----*/

State
set_color(newcolor)
    Int    newcolor;
begin
    if ((newcolor < LTWHITE) || (newcolor > DKMAGENTA))
        newcolor = LTBLACK;

    vsl_color(Device,newcolor);
    vsf_color(Device,newcolor);

```

```

        vst_color(Device,newcolor);
        Winlist[Active_win].wincol = newcolor;
end

/*-----*/
/* sys_init: Function to initialize the Gem system to run the Abstract */
/*   Specification Interface */
/*-----*/
        State
sys_init()
begin
        Int      I;
        Int      outarr[4];

        outarr[0] = 50;
        outarr[1] = 50;
        outarr[2] = 200;
        outarr[3] = 200;

        ap_id = appl_init();

        if (ap_id < 0)
        begin
                for(I = 0; I < -1; I++) ;
        end

        for (I = 0; I < 10; I++)
                work_in[I] = 1;

        work_in[10] = 2;

        gem_Device = graf_handle(&hwchar,&hhchar,&hwbox,&hhbox);
        Device = gem_Device;

        v_opnvwk(work_in,&Device,work_out);
        vsf_perimeter(Device,0);

        scrn_form.mp = 0x0L;
        graf_mouse(0,MOUSEADDR);

        wind_init();

        set_xfer_mode(REPLACE);
        set_pattern(SOLID);
        set_color(LTBLACK);

end

/*-----*/
/* sys_end: Function which returns all allocated resources to the GEM */
/*   system on the end of the program. */
/*-----*/

```

```

/*-----*/
    State
sys_end()

begin
    Int    I;

    for(I = 0; I < MAXNUMWIN; I++)
    begin
        if (Alloc_win[I] != 0)
        begin
            if (Winlist[Alloc_win[I]].Visible)
                wind_close(Winlist[Alloc_win[I]].Winhandle);

            wind_delete(Winlist[Alloc_win[I]].Winhandle);
        end
    end

    v_clsvwk(Device);
    appl_exit();
end

/*-----*/
/*-----*/

```

```

    Window_id
set_new_window(InitRect,Partspec,Title,is_Visible)
    Rect          *InitRect;
    unsigned int   Partspec;
    Char           *Title;
    Bool           is_Visible;

begin
    Bool          NoErrorFlag; /* no error encountered */
    Window_id     Recnum;      /* number of window record alloc */
    Int            temphand;    /* temporary window handle */
    Long           tempaddr;    /* temporary address */
    Int            haddr;       /* high address of title */
    Int            laddr;       /* low address of title */
    Int            outarr[4];    /* input array to GEM VDI */

                                /* get rid of unnecessary specs */
    Partspec = Partspec & 0xFFEB;

    NoErrorFlag = get_next_rec(&Recnum);

                                /* if able to allocate window */
    if (!NoErrorFlag)
        return(INVAL_WIN);

    else

```

```

begin
                                /* GEM defination of window */

Winlist[Recnum].Winhandle = wind_create(Partspec,
                                0,0,700,700);
temphand = Winlist[Recnum].Winhandle;

if (temphand < DESK_WIN)
begin
    dalloc_win(Recnum);
    return(INVAL_WIN);
end

                                /* Set optional window features */
                                /* Set horizontal scroll bar value */

if ((Partspec & W_HSCROLL) > 0)
begin
    wind_set(temphand,WF_HSLSIZE,-1,0,0,0);
    wind_set(temphand,WF_HSLIDE,0,0,0,0);
    Winlist[Recnum].H_value = 0;
end

                                /* Set vertical scroll bar value */

if ((Partspec & W_VSCROLL) > 0)
begin
    wind_set(temphand,WF_VSLSIZE,-1,0,0,0);
    wind_set(temphand,WF_VSLIDE,0,0,0,0);
    Winlist[Recnum].V_value = 0;
end

                                /* Set Title */

if ((Partspec & W_NAME) > 0)
begin
    haddr = (Int) LHIWD(ADDR(Title));
    laddr = (Int) LLOWD(ADDR(Title));
    wind_set(temphand,WF_NAME,laddr,haddr,0,0);
end

                                /* map defination rectangle to */
                                /* desktop coordinates */

get_gem_rect(InitRect,&(outarr[0]),&(outarr[1]),&(outarr[2]),
    &(outarr[3]));
do_map(&(Winlist[DESK_WIN].Coordmap),&(outarr[0]),
    &(outarr[1]));
set_point(20,20,&(Winlist[Recnum].txtpen));

Winlist[Recnum].defX = outarr[0];
Winlist[Recnum].defY = outarr[1];
Winlist[Recnum].defW = outarr[2];

```

```

Winlist[Recnum].defH = outarr[3];

        /* draw visible windows to screen*/
        /* and make active */

if (is_Visible == TRUE)
begin
    NoErrorFlag = wind_open(temphand,outarr[0],outarr[1],
        outarr[2],outarr[3]);

    wind_get(temphand,WF_WXYWH,&outarr[0],&outarr[1],
        &outarr[2],&outarr[3]);

        /* set clip area to window */
        /* content region and whiten */

    outarr[2] += (outarr[0] - 1);
    outarr[3] += (outarr[1] - 1);

    vs_clip(Device,1,outarr);
    whiterec(outarr);
    Active_win = Recnum;

    set_map(&(Winlist[Recnum].Coordmap),0,0,
        outarr[0],outarr[1]);

        /* set GEM VDI global drawing */
        /* parameters and record in */
        /* window record */

    set_color(LTBLACK);
    set_xfer_mode(REPLACE);
    set_pattern(SOLID);
end

        /* set the window's drawing */
        /* parameters */

else
begin
    Winlist[Active_win].wincol = LTBLACK;
    Winlist[Active_win].winpat = SOLID;
    Winlist[Active_win].winmode = REPLACE;
end

Winlist[Recnum].Visible = is_Visible;

return(Recnum);

end
end

```



```

/*-----*/
/* close_window: Function to close and permanently deallocate the */
/* specified window. */
/*-----*/

```

```

    State
close_window(Id)

    Window_id    Id;

begin

    Int    Recnum;

    for (Recnum = 0;
        ((Recnum < MAXNUMWIN) && (Alloc_win[Recnum] != Id));
        Recnum++);

    if (Recnum >= MAXNUMWIN)
        return;

    hide_window(Id);
    wind_delete(Winlist[Id].Winhandle);
    dalloc_win(Recnum);

end

```

```

/*-----*/
/* update_win: Function which sets the system into the update window */
/* mode. In this mode, drawing will be limited to the visible region */
/* of the window to be updated (as identified by the ID number input) */
/* to the function. When given an rectangular area to update, the */
/* function will return the intersection between that area and one of */
/* the rectangles which define the visible area of the window to be */
/* updated. */
/*-----*/

```

```

    Bool
update_win(ID,Up_rct,Dr_rct)

    Window_id    ID;
    Rect          *Up_rct,*Dr_rct;

begin

    Int    Firstx;          /* top left x of first vis rect */
    Int    Firsty;          /* top left y of first vis rect */
    Int    Firstw;          /* width of first visible rect */
    Int    Firsth;          /* height of first visible rect */
    Int    outarr[4];       /* GEM VDI input array */

                                /* get first visible rectangle */

```

```

wind_get(Winlist[ID].Winhandle,WF_FIRSTXYWH,&Firstx,&Firsty,&Firstw,
&Firsth);

```

```

if ((Firstw > 0) && (Firsth > 0))
begin

```

```

/* calculate intersection of          */
/* visible rectangle and rect to      */
/* be updated                          */

```

```

do_rev_map(&(Winlist[ID].Coordmap),&Firstx,&Firsty);
Firstw += Firstx - 1;
Firsth += Firsty - 1;

```

```

Assign_rect(Firstx,Firsty,Firstw,Firsth,Dr_rct);

```

```

set_insect_rect(Up_rct,Dr_rct,Dr_rct);

```

```

/* set clip area to intersection      */
/* rectangle and whiten               */

```

```

get_gem_rect(Dr_rct,&outarr[0],&outarr[1],&outarr[2],
&outarr[3]);
do_map(&(Winlist[ID].Coordmap),&outarr[0],&outarr[1]);
outarr[2] += (outarr[0] - 1);
outarr[3] += (outarr[1] - 1);

```

```

/* remember which is top window      */

```

```

Last_active = Active_win;
Active_win = ID;
activedraw();

```

```

vs_clip(Device,1,outarr);
whiterec(outarr);

```

```

/* set GEM update mode               */

```

```

wind_update(1);
Update_in_prog = TRUE;
return(TRUE);

```

```

end

```

```

else

```

```

return(FALSE);

```

```

end

```

```

/*-----*/
/* next_update: Function which returns the intersection of the desired */
/* update area (Up_rct) and the next rectangle in the gem rectangle    */
/* list which defines the visible area of a window (output is Dr_rct). */

```

```

/* A function return of false indicates no more rectangles are left in      */
/* the gem visible rectangle list.                                         */
/*-----*/

Bool
next_update(Up_rct,Dr_rct)

    Rect    *Up_rct,*Dr_rct;

begin
    Int      Nextx;                /* top left x of next vis rect */
    Int      Nexty;                /* top left y of next vis rect */
    Int      Nextw;                /* width of next visible rect  */
    Int      Nexth;                /* height of next visible rect */
    Int      outarr[4];            /* GEM VDI input array         */

    if (Update_in_prog)
    begin

        /* get next visible rectangle */

        wind_get(Winlist[Active_win].Winhandle,WF_NEXTXYWH,&Nextx,
            &Nexty,&Nextw,&Nexth);

        if ((Nextw > 0) && (Nexth > 0))
        begin

            /* calculate intersection of */
            /* visible rectangle and rect to */
            /* be updated */

            do_rev_map(&(Winlist[Active_win].Coordmap),
                &Nextx,&Nexty);
            Nextw += Nextx - 1;
            Nexth += Nexty - 1;

            Assign_rect(Nextx,Nexty,Nextw,Nexth,Dr_rct);
            set_insect_rect(Up_rct,Dr_rct,Dr_rct);

            /* set clip area to intersection*/
            /* rectangle and whiten */

            get_gem_rect(Dr_rct,&outarr[0],&outarr[1],
                &outarr[2],&outarr[3]);
            do_map(&(Winlist[Active_win].Coordmap),
                &outarr[0],&outarr[1]);
            outarr[2] += (outarr[0] - 1);
            outarr[3] += (outarr[1] - 1);
            vs_clip(Device,1,outarr);
            whiterect(outarr);

            return(TRUE);
        end
    end
end

```

```

        else
            return(FALSE);
    end

    else
        return(FALSE);
    end

end

/*-----*/
/* end_update: procedure to end the update mode and restore the clip */
/* area to match the active (topmost) window. */
/*-----*/
State
end_update()
begin
    Int    outarr[4];

    if (Update_in_prog)
    begin
        Active_win = Last_active;
        wind_get(Winlist[Active_win].Winhandle,
        WF_WXYWH,&outarr[0],&outarr[1],&outarr[2],&outarr[3]);

        outarr[2] += (outarr[0] - 1);
        outarr[3] += (outarr[1] - 1);
        vs_clip(Device,1,outarr);
        activedraw();
        wind_update(0);
        Update_in_prog = FALSE;
    end
end

/*-----*/
/* Note for all drawing routines: mouse is hidden during all drawing */
/* routines to prevent unwanted interaction between the drawing */
/* being done and the mouse buffer which is used to save and restore */
/* the background behind the mouse. */
/*-----*/

/*-----*/
/* drawline: Function which draws a line in the currently active window. */
/* Input coordinates are relative to the top left hand corner of the */
/* active window. */
/*-----*/
State
drawline(St_pt,End_pt)

    Point  *St_pt,*End_pt;

```

```

begin
    Int    outarr[4];

    if (!equalpt(St_pt,End_pt))
    begin
        outarr[0] = (St_pt -> h);
        outarr[1] = (St_pt -> v);
        outarr[2] = (End_pt -> h);
        outarr[3] = (End_pt -> v);

        do_map(&(Winlist[Active_win].Coordmap),&outarr[0],&outarr[1]);
        do_map(&(Winlist[Active_win].Coordmap),&outarr[2],&outarr[3]);

        graf_mouse(HIDEMOUSE,MOUSEADDR);
        v_pline(Device,2,outarr);
        graf_mouse(SHOWMOUSE,MOUSEADDR);
    end
end

/*-----*/
/* drawrect: Function to draw the outline of a rectangle in the active */
/* window. The coordinates of the input rectangle are asumed to be    */
/* relative to the top left corner of the active window's work area.  */
/*-----*/
State
drawrect(In_rect)

    Rect    *In_rect;

begin
    Int    outarr[10];

    if (!equalpt(&((*In_rect).topLeft),&((*In_rect).botRight)))
    begin
        outarr[0] = (*In_rect).topLeft.h;
        outarr[1] = (*In_rect).topLeft.v;
        outarr[4] = (*In_rect).botRight.h - 1;
        outarr[5] = (*In_rect).botRight.v - 1;

        do_map(&(Winlist[Active_win].Coordmap),&outarr[0],&outarr[1]);
        do_map(&(Winlist[Active_win].Coordmap),&outarr[4],&outarr[5]);

        outarr[2] = outarr[4];
        outarr[3] = outarr[1];
        outarr[6] = outarr[0];
        outarr[7] = outarr[5];
        outarr[8] = outarr[0];
        outarr[9] = outarr[1];
    end
end

```

```

        graf_mouse(HIDEMOUSE,MOUSEADDR);
        v_pline(Device,5,outarr);
        graf_mouse(SHOWMOUSE,MOUSEADDR);
    end
end

/*-----*/
/* drawellipse: Function which draws an ellipse within the area of the */
/* active window specified by the input rectangle. The coordinates */
/* of the input rectangle are assumed to be relative to the top left */
/* corner of the work area of the active window. */
/*-----*/
State
drawellipse(In_rect)

    Rect    *In_rect;

begin
    Int      x_ctr,y_ctr,x_rad,y_rad;
    Int      tempp,tempxfer;

    if (!equalpt(&((*In_rect).topLeft),&((*In_rect).botRight)))
    begin

        polar_coord(In_rect,&x_ctr,&y_ctr,&x_rad,&y_rad);
        do_map(&(Winlist[Active_win].Coordmap),&x_ctr,&y_ctr);

        graf_mouse(HIDEMOUSE,MOUSEADDR);
        v_ellarc(Device,x_ctr,y_ctr,x_rad,y_rad,0,3600);
        graf_mouse(SHOWMOUSE,MOUSEADDR);
    end
end

/*-----*/
/* drawarc: Function which draws an elliptical arc between the two */
/* input angles (begang and endang) specified and within the */
/* rectangular area of the active window specified. The input */
/* rectangle is assumed to be relative to the top left corner of the */
/* work area of the active window. Angles are reversed to force */
/* correspondence with Mac. */
/*-----*/
State
drawarc(R,begang,endang)

    Rect    *R;
    Int      begang,endang;

begin
    Int      x_ctr,y_ctr,x_rad,y_rad;

```



```

if (!equalpt(&((*R).topLeft),&((*R).botRight)))
begin

    polar_coord(R,&x_ctr,&y_ctr,&x_rad,&y_rad);
    do_map(&(Winlist[Active_win].Coordmap),&x_ctr,&y_ctr);

    map_angle(&begang);
    map_angle(&endang);
    graf_mouse(HIDEMOUSE,MOUSEADDR);
    v_ellarc(Device,x_ctr,y_ctr,x_rad,y_rad,endang,begang);
    graf_mouse(SHOWMOUSE,MOUSEADDR);

end

end

/*-----*/
/* drawrndrect: Function which draws the outline of a rounded rectangle */
/* within the specified rectangular area of the active window. */
/*-----*/
State
drawrndrct(In_rect)

    Rect    *In_rect;

begin
    Int      outarr[4];

    if (!equalpt(&((*In_rect).topLeft),&((*In_rect).botRight)))
    begin

        outarr[0] = (*In_rect).topLeft.h;
        outarr[1] = (*In_rect).topLeft.v;
        outarr[2] = (*In_rect).botRight.h - 1;
        outarr[3] = (*In_rect).botRight.v - 1;

        do_map(&(Winlist[Active_win].Coordmap),&outarr[0],&outarr[1]);
        do_map(&(Winlist[Active_win].Coordmap),&outarr[2],&outarr[3]);

        graf_mouse(HIDEMOUSE,MOUSEADDR);
        v_rbox(Device,outarr);
        graf_mouse(SHOWMOUSE,MOUSEADDR);

    end

end

end

/*-----*/
/* fillrect: Function which draws a pattern within the specified */
/* rectangular area of the active window. */
/*-----*/
State

```



```

fillrect(In_rect)

    Rect    *In_rect;

begin
    Int      outarr[4];

    if (!equalpt(&((*In_rect).topLeft),&((*In_rect).botRight)))
    begin

        outarr[0] = (*In_rect).topLeft.h;
        outarr[1] = (*In_rect).topLeft.v;
        outarr[2] = (*In_rect).botRight.h - 1;
        outarr[3] = (*In_rect).botRight.v - 1;

        do_map(&(Winlist[Active_win].Coordmap),&outarr[0],&outarr[1]);
        do_map(&(Winlist[Active_win].Coordmap),&outarr[2],&outarr[3]);

        graf_mouse(HIDEMOUSE,MOUSEADDR);
        vr_recfl(Device,outarr);
        graf_mouse(SHOWMOUSE,MOUSEADDR);
    end
end

```

```

/*-----*/
/* fillrndrect: Function which fills the outline of a rounded rectangle */
/* within the specified rectangular area of the active window. */
/*-----*/

```

```

    State
fillrndrct(In_rect)

    Rect    *In_rect;

begin
    Int      outarr[4];

    if (!equalpt(&((*In_rect).topLeft),&((*In_rect).botRight)))
    begin

        outarr[0] = (In_rect -> topLeft).h;
        outarr[1] = (In_rect -> topLeft).v;
        outarr[2] = (In_rect -> botRight).h - 1;
        outarr[3] = (In_rect -> botRight).v - 1;

        do_map(&(Winlist[Active_win].Coordmap),&outarr[0],&outarr[1]);
        do_map(&(Winlist[Active_win].Coordmap),&outarr[2],&outarr[3]);

        graf_mouse(HIDEMOUSE,MOUSEADDR);
        v_rfbbox(Device,outarr);
    end
end

```

```

        graf_mouse(SHOWMOUSE,MOUSEADDR);
    end

end

/*-----*/
/* fillellipse: Function which fills an ellipse within the area of the */
/* active window specified by the input rectangle. The coordinates */
/* of the input rectangle are assumed to be relative to the top left */
/* corner of the work area of the active window. */
/*-----*/
    State
fillellipse(In_rect)

    Rect    *In_rect;

begin
    Int      x_ctr,y_ctr,x_rad,y_rad;

    if (!equalpt(&((*In_rect).topLeft),&((*In_rect).botRight)))
    begin

        polar_coord(In_rect,&x_ctr,&y_ctr,&x_rad,&y_rad);
        do_map(&(Winlist[Active_win].Coordmap),&x_ctr,&y_ctr);

        graf_mouse(HIDEMOUSE,MOUSEADDR);
        v_ellipse(Device,x_ctr,y_ctr,x_rad,y_rad);
        graf_mouse(SHOWMOUSE,MOUSEADDR);
    end

end

end

/*-----*/
/* fillarc: Function which fills an elliptical arc between the two */
/* input angles (begang and endang) specified and within the */
/* rectangular area of the active window specified. The input */
/* rectangle is assumed to be relative to the top left corner of the */
/* work area of the active window. Angles are reversed in the GEM */
/* function call to force correspondence to Mac. */
/*-----*/
    State
fillarc(R,begang,endang)

    Rect    *R;
    Int      begang,endang;

begin
    Int      x_ctr,y_ctr,x_rad,y_rad;

    if (!equalpt(&((*R).topLeft),&((*R).botRight)))
    begin

```

```

    polar_coord(R,&x_ctr,&y_ctr,&x_rad,&y_rad);
    do_map(&(Winlist[Active_win].Coordmap),&x_ctr,&y_ctr);

    map_angle(&begang);
    map_angle(&endang);
    graf_mouse(HIDEMOUSE,MOUSEADDR);
    v_ellpie(Device,x_ctr,y_ctr,x_rad,y_rad,endang,begang);
    graf_mouse(SHOWMOUSE,MOUSEADDR);
end

end

/*-----*/
/* activate_win: Function which causes the specified window to become */
/* the active window. It causes any window (but the desktop with a */
/* id number of 0) to be moved to the top and a new background will */
/* be drawn in, however, the contents will not be automatically */
/* redrawn. */
/*-----*/
State
activate_win(ID)
    Window_id    ID;

begin
    Int    outarr[4];          /* input to GEM VDI */

    if (!(ID == Active_win))
    begin
        if ((ID >= DESK_WIN))

            /* if not the desktop, bring */
            /* specified window to top */

            if((ID >= 1) && (ID <= MAXNUMREC))
            begin
                graf_mouse(HIDEMOUSE,0X0L);
                wind_set(Winlist[ID].Winhandle,WF_TOP,0,0,0,0);
            end

            /* set clip area to content area */

            Active_win = ID;
            wind_get(Winlist[ID].Winhandle,WF_WXYWH,&outarr[0],
                &outarr[1],&outarr[2],&outarr[3]);

            outarr[2] += (outarr[0] - 1);
            outarr[3] += (outarr[1] - 1);

            vs_clip(Device,1,outarr);

```

```

        if ((ID >= 1) && (ID <= MAXNUMREC))
            graf_mouse(SHOWMOUSE,0X0L);

        activedraw();

    end

end

/*-----*/
/* hscroll: Function which scrolls the content area of the active window */
/* by the number of "pixels" specified by num. If the num is */
/* positive, the region will move to the left, and to the right if */
/* negative. */
/*-----*/
State
hscroll(num,Up_rect)

    Int    num;
    Rect    *Up_rect;

begin
    Int    X;                /* top left x of content area */
    Int    Y;                /* top left y of content area */
    Int    W;                /* width of content area */
    Int    H;                /* height of content area */
    Int    outarr[8];         /* output to GEM VDI bit copy fcn */
    Int    whtarr[4];         /* GEM VDI rectangle to whiten */

    if (!(num == 0))
        begin

            /* set to scroll the content area */
            /* left and whiten the vacated */
            /* rectangle */

            if (num > 0)
                begin
                    wind_get(Winlist[Active_win].Winhandle,
                        WF_WXYWH,&X,&Y,&W,&H);
                    outarr[0] = X + num;
                    outarr[1] = Y;
                    outarr[2] = X + W - 1;
                    outarr[3] = Y + H - 1;
                    outarr[4] = X;
                    outarr[5] = Y;
                    outarr[6] = X + W - 1 - num;
                    outarr[7] = Y + H - 1;
                    whtarr[0] = outarr[6];
                    whtarr[1] = outarr[1];
                    whtarr[2] = outarr[2];

```

```

        whtar[3] = outarr[3];
end
        /* set to scroll the content area */
        /* right and whiten the vacated */
        /* rectangle */

if (num < 0)
begin
    wind_get(Winlist[Active_win].Winhandle,
              WF_WXYWH,&X,&Y,&W,&H);
    outarr[0] = X;
    outarr[1] = Y;
    outarr[2] = X + W - 1 + num;
    outarr[3] = Y + H - 1;
    outarr[4] = X - num;
    outarr[5] = Y;
    outarr[6] = X + W - 1;
    outarr[7] = Y + H - 1;
    whtar[0] = outarr[0];
    whtar[1] = outarr[1];
    whtar[2] = outarr[4];
    whtar[3] = outarr[3];
end

        /* bit copy to scroll */

    graf_mouse(HIDEMOUSE,0X0L);
    vro_cpyfm(Device,3,outarr,&scrn_form,&scrn_form);
    graf_mouse(SHOWMOUSE,0X0L);
    translate_origin(Active_win,num,0);
    whiterec(whtar);

end

else
    for(X = 0; X < 4; X++)
        whtar[X] = 0;

        /* assign the rect to be updated */
        /* in window local coord */

    do_rev_map(&(Winlist[Active_win].Coordmap),&whtar[0],&whtar[1]);
    do_rev_map(&(Winlist[Active_win].Coordmap),&whtar[2],&whtar[3]);

    assign_rect(whtar[0],whtar[1],whtar[2],whtar[3],Up_rect);
end

/*-----*/
/* vscroll: Function which scrolls the content area of the active window */
/* by the number of "pixels" specified by num. If the num is */
/* positive, the region will move up,and down if negative. */

```

```

/*-----*/
    State
vscroll(num,Up_rect)

    Int    num;
    Rect   *Up_rect;

begin
    Int    X;                /* top left x of content area */
    Int    Y;                /* top left y of content area */
    Int    W;                /* width of content area */
    Int    H;                /* height of content area */
    Int    outarr[8];        /* output to GEM VDI bit copy fcn */
    Int    whtarr[4];        /* GEM VDI rectangle to whiten */

    if (!(num == 0))
    begin

        /* set to scroll the content area */
        /* up and whiten the vacated */
        /* rectangle */

        if (num > 0)
        begin
            wind_get(Winlist[Active_win].Winhandle,
                    WF_WXYWH,&X,&Y,&W,&H);
            outarr[0] = X;
            outarr[1] = Y + num;
            outarr[2] = X + W - 1;
            outarr[3] = Y + H - 1;
            outarr[4] = X;
            outarr[5] = Y;
            outarr[6] = X + W - 1;
            outarr[7] = Y + H - 1 - num;
            whtarr[0] = outarr[0];
            whtarr[1] = outarr[7];
            whtarr[2] = outarr[2];
            whtarr[3] = outarr[3];
        end

        /* set to scroll the content area */
        /* down and whiten the vacated */
        /* rectangle */

        if (num < 0)
        begin
            wind_get(Winlist[Active_win].Winhandle,
                    WF_WXYWH,&X,&Y,&W,&H);
            outarr[0] = X;
            outarr[1] = Y;
            outarr[2] = X + W - 1;
            outarr[3] = Y + H - 1 + num;
            outarr[4] = X;

```



```

        outarr[5] = Y - num;
        outarr[6] = X + W - 1;
        outarr[7] = Y + H - 1;
        whtarr[0] = outarr[0];
        whtarr[1] = outarr[1];
        whtarr[2] = outarr[2];
        whtarr[3] = outarr[5];
    end

                                /* bit copy to scroll          */

    graf_mouse(HIDEMOUSE,0X0L);
    vro_cpyfm(Device,3,outarr,&scrn_form,&scrn_form);
    graf_mouse(SHOWMOUSE,0X0L);
    translate_origin(Active_win,0,num);
    whiterec(whtarr);

end

else
    for(X = 0; X < 4; X++)
        whtarr[X] = 0;

                                /* assign the rect to be updated      */
                                /* in window local coord          */

    do_rev_map(&(Winlist[Active_win].Coordmap),&whtarr[0],&whtarr[1]);
    do_rev_map(&(Winlist[Active_win].Coordmap),&whtarr[2],&whtarr[3]);

    assign_rect(whtarr[0],whtarr[1],whtarr[2],
                whtarr[3],Up_rect);
end

/*-----*/
/* set_hscroll: Function which sets the value of the horizontal scroll */
/* bar of the active window to the input val.                          */
/*-----*/
State
set_hscroll(val)

    Int    val;

begin

    if (val < 0)
        val = 0;

    if (val > 1000)
        val = 1000;

    wind_set(Winlist[Active_win].Winhandle,WF_HSLIDE,val,0,0,0);
    Winlist[Active_win].H_value = val;

```



```

end

/*-----*/
/* set_vscroll: Function which sets the value of the vertical scroll bar */
/* to the input val. */
/*-----*/
State
set_vscroll(val)

    Int    val;

begin
    if (val < 0)
        val = 0;

    if (val > 1000)
        val = 1000;

    wind_set(Winlist[Active_win].Winhandle,WF_VSLIDE,val,0,0,0);
    Winlist[Active_win].V_value = val;

end

/*-----*/
/* get_hscroll: Function which returns the horizontal scroll bar value. */
/*-----*/
Int
get_hscroll()

begin
    return(Winlist[Active_win].H_value);
end

/*-----*/
/* get_vscroll: Function which returns the vertical scroll bar value. */
/*-----*/
Int
get_vscroll(val)

begin
    return(Winlist[Active_win].V_value);
end

/*-----*/
/* hide_window: Function which removes the specified window from the */
/* screen without deallocating it. */
/*-----*/
State
hide_window(Id)

```

```

    Window_id  Id;

begin
    Int      temphandle;

    if (Winlist[Id].Visible && (Id != DESK_WIN))
    begin
        wind_close(Winlist[Id].Winhandle);
        Winlist[Id].Visible = FALSE;

        if (Id == Active_win)
        begin
            wind_get(0,WF_TOP,&temphandle,0,0,0);
            windowID(temphandle,&Active_win);
            activate_win(Active_win);
        end
    end
end

/*-----*/
/* show_window: Function which draws an invisible but previously defined*/
/* window onto the screen.  This window becomes the active window.  */
/*-----*/
    State
show_window(Id)
    Window_id  Id;

begin
    Int      outarr[4];

    if ((!Winlist[Id].Visible) && (Id != DESK_WIN))
    begin
        wind_open(Winlist[Id].Winhandle,Winlist[Id].defX,
                  Winlist[Id].defY,Winlist[Id].defW,Winlist[Id].defH);
        Winlist[Id].Visible = TRUE;
        activate_win(Id);
    end
end

/*-----*/
/* get_active: Function which returns the identifier of the active */
/* window. */
/*-----*/

    Window_id
get_active()

begin
    return(Active_win);
end

```

```

/*-----*/
/* get_color: Function which returns the identifier of the drawing color */
/*-----*/

```

```

    Color_id
get_color()

```

```

begin
    return(Winlist[Active_win].wincol);
end

```

```

/*-----*/
/* get_mode: Function which returns the identifier of the drawing trans- */
/*      fer mode. */
/*-----*/

```

```

    Mode_id
get_xfer_mode()

```

```

begin
    return(Winlist[Active_win].winmode);
end

```

```

/*-----*/
/* get_pattern: Function which returns the identifier of the drawing */
/*      pattern. */
/*-----*/

```

```

    Pattern_id
get_pattern()

```

```

begin
    return(Winlist[Active_win].winpat);
end

```

```

/*-----*/
/* txtpen: Function which sets the location of the next character to */
/*      be drawn in the active window (location of text pen in window */
/*      local coordinates). */
/*-----*/

```

```

    State
txtpen(inpt)

```

```

    Point  *inpt;

```

```

begin
    copypt(inpt,&(Winlist[Active_win].txtpen));
end

```

```

/*-----*/
/* set_txtpen: Function which returns the location of the text pen for */

```

```

/*      the currently active window (in window local coordinates).      */
/*-----*/
      State
set_ttxpen(pen)

      Point  *pen;

begin
      copypt(&(Winlist[Active_win].ttxpen),pen);
end

/*-----*/
/* drawstring: Function which draws a string into the active window at      */
/*      the current location of its text pen.      */
/*-----*/

      State
drawstring(strptr)

      Char  *strptr;

begin
      Int    x,y;
      Int    extent[8];

      x = Winlist[Active_win].ttxpen.h;
      y = Winlist[Active_win].ttxpen.v;

      do_map(&(Winlist[Active_win].Coordmap),&x,&y);

      graf_mouse(HIDEMOUSE,MOUSEADDR);
      v_gtext(Device,x,y,strptr);
      graf_mouse(SHOWMOUSE,MOUSEADDR);

      vqt_extent(Device,strptr,extent);

      Winlist[Active_win].ttxpen.h += extent[2];

end

/*-----*/
/* drawchar: Function which draws a character at the current location of      */
/*      the active window's text pen.      */
/*-----*/

      State
drawchar(inchr)

      Char  inchr;

```

```

begin
    Char    outstr[2];
    Int     x,y;
    Int     extent[8];

    if (Winlist[Active_win].winmode != XOR)
        vswr_mode(Device,TRANSPAR);

    outstr[0] = inchr;
    outstr[1] = NUL_CHR;

    x = Winlist[Active_win].txtpen.h;
    y = Winlist[Active_win].txtpen.v;

    do_map(&(Winlist[Active_win].Coordmap),&x,&y);

    graf_mouse(HIDEMOUSE,MOUSEADDR);
    v_gtext(Device,x,y,outstr);
    graf_mouse(SHOWMOUSE,MOUSEADDR);
    vqt_extent(Device,outstr,extent);

    Winlist[Active_win].txtpen.h += extent[2];

    if (Winlist[Active_win].winmode != XOR)
        vswr_mode(Device,Winlist[Active_win].winmode);

end

/*-----*/
/* get_wchar: Function which returns the current character width.      */
/*-----*/
    Int
get_wchar()

begin
    return(hwchar);
end

/*-----*/
/* get_hchar: Function which returns the current character height.     */
/*-----*/
    Int
get_hchar()

begin
    return(hhchar);
end

```

```

/*-----*/
/*                      ASWINI.C                      */
/*-----*/

/* Module global data declarations -- These variables are required to */
/* be global to allow linkage with the GEM driver modules.          */

Int    contrl[12];
Int    intin[128];
Int    ptsin[128];
Int    intout[128];
Int    ptsout[128];

/* Local data declarations of data structures to be hidden from the */
/* user.                                                              */

static Int    hwchar;          /* width of a character */
static Int    hhchar;          /* height of a character */
static Int    hwbox;           /* width of a character box */
static Int    hhbox;           /* height of a character box */
static Int    work_in[11];     /* GEM open v workstation input */
static Int    work_out[57];    /* GEM open v workstation output */
static Int    ap_id;           /* GEM application id */

static Int    Device;          /* handle for GEM virtual screen */
static Int    gem_Device;      /* handle for GEM screen */

typedef struct Map              /* type definition of global to */
begin                          /* window local coordinate map */
    Int    Xorigin;            /* horiz window origin */
    Int    Yorigin;            /* vert window origin */
    Int    Xreal;              /* horiz real screen coord */
    Int    Yreal;              /* vert real screen coord */
end
Map;

typedef struct Winrec           /* window record structure */
begin
    Int    Winhandle;          /* GEM window handle */
    Map    Coordmap;           /* global to local map */
    Int    H_value;            /* current horiz scroll value */
    Int    V_value;            /* current vert scroll value */
    Bool    Visible;           /* is window visible on screen */
    Int    defX;               /* global x of entire window */
    Int    defY;               /* global y of entire window */
    Int    defW;               /* width of entire window */
    Int    defH;               /* height of entire window */
    Point    txtptn;           /* location to draw next txt */
    Mode_id    winmode;        /* window drawing mode */
    Pattern_id    winpat;      /* window drawing pattern */
    Color_id    wincol;        /* window color */
end

```



```

Winrec;

/* records for windows + desk */
static Winrec Winlist[MAXNUMREC];

/* array of available record indeces */
static Window_id Available_win[MAXNUMWIN];

/* array of allocated record indexes */
static Window_id Alloc_win[MAXNUMWIN];

static Window_id Active_win; /* index of active window */
static Window_id Last_active; /* index of previous active window */
static Bool Update_in_prog; /* is update occuring */

static MFDB scrn_form; /* GEM bit block str for screen */
static U_int button_flag; /* flag to determine whether to
/* look for mouse up or down */

static Long baraddr; /* address of the GEM menu bar */
static Int mhilghted; /* object index of hilghted menu */

Evtmsg Message; /* event message for user */

#include "asevti.c"
#include "asevt.c"

/*-----*/
/* init_alloc_str: Function to initialize the structures (Available_win
/* and Active_win) used to keep track of window records available to
/* be allocated and already allocated.
/*-----*/
State
init_alloc_str()
begin
    Int I;
    for (I = 0; I < MAXNUMWIN; I++)
    begin
        Available_win[I] = I + 1;
        Alloc_win[I] = 0;
    end
end

/*-----*/
/* wind_init: Function to initialize the record for the desktop window
/* and set it to be the initial active window.
/*-----*/
State
wind_init()
begin
    Bool NoErrorFlag;

```



```

Int    X,Y,W,H,outarr[4];
Point  tmppoint;

Winlist[DESK_WIN].Winhandle = DESK_WIN;

NoErrorFlag = wind_get(DESK_WIN,WF_WXYWH,&X,&Y,&W,&H);

        /* set desktop coordinate map */
Winlist[DESK_WIN].Coordmap.Xorigin = 0;
Winlist[DESK_WIN].Coordmap.Yorigin = 0;
Winlist[DESK_WIN].Coordmap.Xreal = X;
Winlist[DESK_WIN].Coordmap.Yreal = Y;

Winlist[DESK_WIN].Visible = TRUE;

        /* set defination coordinates and clip rectangle */

Winlist[DESK_WIN].defX = X;
Winlist[DESK_WIN].defY = Y;
Winlist[DESK_WIN].defW = W;
Winlist[DESK_WIN].defH = H;
outarr[0] = X;
outarr[1] = Y;
outarr[2] = W + X - 1;
outarr[3] = H + Y - 1;

vs_clip(Device,1,outarr);

set_point(0,0,&(Winlist[DESK_WIN].txtpen));

init_alloc_str();
Active_win = 0;
Last_active = 0;
Update_in_prog = FALSE;
button_flag = LOOKMDOWN;
mhilighted = 0;
end

/*-----*/
/* activedraw: Function to set the global drawing parameters of the GEM */
/*      VDI to those of the drawing window. */
/*-----*/

State
activedraw()

begin
    set_pattern(Winlist[Active_win].winpat);
    set_color(Winlist[Active_win].wincol);
    set_xfer_mode(Winlist[Active_win].winmode);
end

```

```

/*-----*/
/* get_gem_rect: Hidden function to give the x and y coordinates of the */
/* top left corner of an 'abstract' rectangle along with its width */
/* and height. */
/*-----*/
State
get_gem_rect(R,X,Y,W,H)
Rect *R;
Int *X,*Y,*W,*H;

begin
(*X) = (R -> topLeft).h;
(*Y) = (R -> topLeft).v;
(*W) = (R -> botRight).h - (R -> topLeft).h + 1;
(*H) = (R -> botRight).v - (R -> topLeft).v + 1;
end

/*-----*/
/* do_map: Function to map window local coordinates (x and y */
/* coordinates) to global screen coordinates which Gem VDI will */
/* recognize. */
/*-----*/
State
do_map(Cmap,X,Y)
Map *Cmap;
Int *X,*Y;

begin
(*X) += (Cmap -> Xreal) - (Cmap -> Xorigin);
(*Y) += (Cmap -> Yreal) - (Cmap -> Yorigin);
end

/*-----*/
/* do_rev_map: Function to map global screen coordinates to window local */
/* coordinates as defined by the input coordinate map (Cmap). */
/*-----*/
State
do_rev_map(Cmap,X,Y)
Map *Cmap;
Int *X,*Y;

begin
(*X) -= (Cmap -> Xreal) - (Cmap -> Xorigin);
(*Y) -= (Cmap -> Yreal) - (Cmap -> Yorigin);
end

/*-----*/
/* set_map: Function to set the mapping from window local coordinates */
/* to screen global coordinates. */
/*-----*/
State
set_map(Cmap,Orig_x,Orig_y,Real_x,Real_y)

```

```

    Map    *Cmap;
    Int     Orig_x,Orig_y,Real_x,Real_y;

begin
    (Cmap -> Xorigin) = Orig_x;
    (Cmap -> Yorigin) = Orig_y;
    (Cmap -> Xreal) = Real_x;
    (Cmap -> Yreal) = Real_y;
end

/*-----*/
/* get_next_rec: Function which returns a boolean TRUE if a window */
/* is available for allocation, FALSE otherwise. The index to the */
/* allocated record is returned as the integer pointed to by RECNUM */
/*-----*/
Bool
get_next_rec(Recnum)
    Int     *Recnum;
begin
    Int     I,J;

    I = 0;
    J = 0;

    while ((Available_win[I] == 0) && (I < MAXNUMWIN))
        I++;

    while ((Alloc_win[J] != 0) && (J < MAXNUMWIN))
        J++;

    if (I >= MAXNUMWIN)
        return(FALSE);
    else
        begin
            Alloc_win[J] = Available_win[I];
            (*Recnum) = Available_win[I];
            Available_win[I] = 0;
            return(TRUE);
        end
end

/*-----*/
/* dalloc_win: Deallocates an allocated window record */
/*-----*/
State
dalloc_win(Recnum)
    Int     Recnum;
begin
    Int     I,J;

    if ((Recnum > 0) && (Recnum < 9))
        begin

```

```

        I = 0;
        J = 0;

        while ((Alloc_win[J] != Recnum) && (J < MAXNUMWIN))
            J++;

        while ((Available_win != 0) && (I < MAXNUMWIN))
            I++;

        if ((J < MAXNUMWIN) && (I < MAXNUMWIN))
            begin
                Available_win[I] = Alloc_win[J];
                Alloc_win[J] = 0;
            end
        end
    end
end

/*-----*/
/* whiterec: Paints the rectangle specified by the array of 4 integers */
/* pointed to by outarr white. Array must be in the form: [0]: */
/* x of top left point, [1]: y of top left point, [2]: x of bottom */
/* right point, [3]: y of bottom right point. All points must be in */
/* global screen coordinates. */
/*-----*/
    State
whiterec(outarr)

    Int      *outarr;

begin

    Mode_id      tempxfer;
    Pattern_id    tempp;
    Color_id      tempc;

    graf_mouse(HIDEMOUSE,MOUSEADDR);
    tempxfer = Winlist[Active_win].winmode;
    tempp = Winlist[Active_win].winpat;
    tempc = Winlist[Active_win].wincol;

    set_xfer_mode(REPLACE);
    set_pattern(SOLID);
    set_color(LTWHITE);

    vr_recfl(Device,outarr);

    set_xfer_mode(tempxfer);
    set_pattern(tempp);
    set_color(tempc);
    graf_mouse(SHOWMOUSE,MOUSEADDR);

end

```

```

/*-----*/
/* polar_coord: Function which converts the coordinates of a rectangle */
/* input in the form of two opposing corners into a polar coordinate */
/* like form returning the center of the rectangle and the x and y */
/* radiuses. */
/*-----*/

```

State

polar_coord(R,x_ctr,y_ctr,x_rad,y_rad)

```

Rect   *R;
Int     *x_ctr,*y_ctr,*x_rad,*y_rad;

```

begin

```

Int     gemx,gemy,gemw,gemh;

get_gem_rect(R,&gemx,&gemy,&gemw,&gemh);

```

```

(*x_ctr) = gemx + (gemw / 2);
(*y_ctr) = gemy + (gemh / 2);
(*x_rad) = gemw / 2;
(*y_rad) = gemh / 2;

```

end

```

/*-----*/
/* map_angle: Function which converts a GEM angle to a Mac angle */
/*-----*/

```

State

map_angle(angle)

```

Int     *angle;

```

begin

```

Int     I;

if (angle < 0)
    for(I = (*angle); I < 0; I += 3600);
else
    I = (*angle);

```

```

(*angle) = (900 - I + 3600) % 3600;

```

end

```

/*-----*/
/* translate_origin: Function which moves the origin of the global to */
/* local map of the specified window by the amount dX and dY. */
/*-----*/

```

State

translate_origin(Id,dX,dY)

```

        Int      Id,dX,dY;

begin
    Winlist[Id].Coordmap.Xorigin += dX;
    Winlist[Id].Coordmap.Yorigin += dY;
end

/*-----*/
/*-----*/
    State
greenrec(outarr)

    Int      *outarr;

begin

    Mode_id      tempxfer;
    Pattern_id    tempp;
    Color_id      tempc;

    graf_mouse(HIDEMOUSE,MOUSEADDR);
    tempxfer = Winlist[Active_win].winmode;
    tempp = Winlist[Active_win].winpat;
    tempc = Winlist[Active_win].wincol;

    set_xfer_mode(REPLACE);
    set_pattern(SOLID);
    set_color(LTGREEN);

    vr_recfl(Device,outarr);

    set_xfer_mode(tempxfer);
    set_pattern(tempp);
    set_color(tempc);
    graf_mouse(SHOWMOUSE,MOUSEADDR);

end

/*-----*/
/*-----*/
    State
bluerec(outarr)

    Int      *outarr;

begin

    Mode_id      tempxfer;
    Pattern_id    tempp;
    Color_id      tempc;

```

```
graf_mouse(HIDEMOUSE,MOUSEADDR);  
tempxfer = Winlist[Active_win].winmode;  
tempp = Winlist[Active_win].winpat;  
tempc = Winlist[Active_win].wincol;
```

```
set_xfer_mode(REPLACE);  
set_pattern(SOLID);  
set_color(LTBLUE);
```

```
vr_recfl(Device,outarr);
```

```
set_xfer_mode(tempxfer);  
set_pattern(tempp);  
set_color(tempc);  
graf_mouse(SHOWMOUSE,MOUSEADDR);
```

```
end
```



```

/*-----*/
/*          ASMENU.C          */
/*-----*/

```

```

/*-----*/
/*-----*/

```

```

      State
init_menu(filename,barId)

      char          *filename;
      Menu_id       barId;

begin
      rsrc_load(ADDR(filename));
      rsrc_gaddr(0,barId,&baraddr);
      menu_bar(baraddr,1);
end

```

```

/*-----*/
/*-----*/

```

```

      State
item_enable(menunum,itemnum)

      int    menunum,itemnum;

begin
      menu_ienable(baraddr,itemnum,1);
end

```

```

/*-----*/
/*-----*/

```

```

      State
item_disable(menunum,itemnum)

      int    menunum,itemnum;

begin
      menu_ienable(baraddr,itemnum,0);
end

```

```

/*-----*/
/*-----*/

```

```

      State
item_mark(menunum,itemnum,mark)

      int    menunum,itemnum;
      Bool   mark;

begin

```

```

        menu_ichack(baraddr,itemnum,mark);
end

/*-----*/
/*-----*/

State
menu_hilight(menunum,hilight)

    int    menunum;
    Bool   hilight;

begin
    if (hilight)
        begin
            if (mhilighted > 0)
                menu_tnormal(baraddr,mhilighted,TRUE);

                menu_tnormal(baraddr,menunum,FALSE);
                mhilighted = menunum;
            end

            else if (mhilighted > 0)
                begin
                    menu_tnormal(baraddr,mhilighted,TRUE);
                    mhilighted = 0;
                end
            end
        end
end

```

```

/*-----*/
/*               ASBIND1.H               */
/*-----*/

```

```

#define      begin      {
#define      end        }

```

```

typedef struct Point
begin
    int      v,h;
end
Point;

```

```

typedef struct Rect
begin
    Point    topLeft;
    Point    botRight;
end
Rect;

```

```

typedef      int          Bool;

```

```

#define      Void          /**/
#define      State         /**/

```

```

typedef      int           Int;
typedef      long          Long;
typedef      char          Char;
typedef      unsigned int  U_int;

```

```

typedef      int           Pattern_id;
typedef      int           Mode_id;
typedef      int           Color_id;
typedef      int           Window_id;
typedef      int           Menu_id;

```

```

#define      W_NAME        0x0009
#define      W_CLOSE       0X0002
#define      W_SIZE        0x0020
#define      W_HSCROLL     0x0E00
#define      W_VSCROLL     0X01C0

```

```

#define      INVALID_WIN   -1
#define      DESK_WIN      0
#define      MAXNUMWIN     7
#define      MAXNUMREC     8

```

```

#define      SOLID          1
#define      HEAVYHATCH    2
#define      HATCH          3
#define      LTHATCH       4
#define      EMPTY         5

```

```

#define LTWHITE 0
#define LTBLACK 1
#define LTRED 2
#define LTGREEN 3
#define LTBLUE 4
#define LTCYAN 5
#define LTYELLOW 6
#define LTMAGENTA 7
#define DKWHITE 8
#define DKBLACK 9
#define DKRED 10
#define DKGREEN 11
#define DKBLUE 12
#define DKCYAN 13
#define DKYELLOW 14
#define DKMAGENTA 15

#define REPLACE 1
#define TRANSPAR 2
#define XOR 3
#define REVTRANS 4

#include "portab.h"
#define ASMAIN() GEMAIN()

typedef struct Evtmsg
begin
    int type;
    int winid;
    Rect evrec;
    Point evpoint;
    int scrpart;
    int scrposn;
    int scrmoved;
    char keystroke;
    int mod;
    int mtitle;
    int mitem;
end Evtmsg;

extern Evtmsg Message;

#define EVTTYPE Message.type
#define EVTWINDOW Message.winid
#define EVTRECT Message.evrec
#define EVPOINT Message.evpoint
#define EVTSCRPART Message.scrpart
#define EVTSCRPOSN Message.scrposn
#define EVTSCRMOVE Message.scrmoved
#define EVTKEY Message.keystroke
#define EVTMOD Message.mod
#define EVTMTITLE Message.mtitle

```

#define	EVTMITEM	Message.mitem
#define	REDRAW	0
#define	TOPPED	1
#define	CLOSEWIN	2
#define	SCROLLBAR	3
#define	MOUSEDOWN	4
#define	KEYBOARD	5
#define	MOUSEUP	6
#define	MENUHIT	7
#define	V_PAGEUP	0
#define	V_PAGEDOWN	1
#define	V_ROWUP	2
#define	V_ROWDOWN	3
#define	H_PAGEUP	4
#define	H_PAGEDOWN	5
#define	H_ROWUP	6
#define	H_ROWDOWN	7
#define	V_THUMB	8
#define	H_THUMB	9
#define	MINSER	0
#define	MAXSER	1000
#define	NUL_CHR	'\0'
#define	CARR_RET	0x0D
#define	BACK_SP	0x08
#define	BLANK	0x20
#define	MOUSEADDR	0x0L
#define	HIDEMOUSE	256
#define	SHOWMOUSE	257
#define	LOOKMDOWN	0x0001
#define	LOOKMUP	0x0000

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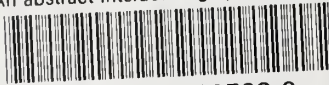
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